A REVIEW OF DECIDUOUS-LEAVED SPECIES OF STEWARTIA (THEACEAE)

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AS WITH MOST GENERA restricted in distribution to eastern and southeastern Asia and eastern North America, the theaceous genus *Stewartia* was based on an eastern North American plant, in this instance one known to eighteenth century European botanists and horticulturists, from Virginia. In fact, it was not until after the recognition of the second species indigenous to North America that an Asiatic species of *Stewartia* was discovered and described, and the genus could be added to the list of genera illustrating the floristic affinities of these two regions. Concomitant with the discovery of the species of *Stewartia*, the plants have been valued as garden ornamentals, and most of the taxa described have become prominent horticultural subjects in American and European gardens and arboreta.

Despite the long and continued horticultural interest in these late spring and summer flowering trees and shrubs, recent attempts to validate the identifications of *Stewartia* in the herbarium and in cultivation at the Arnold Arboretum led to some unexpected confusion that indicated need for a review of the genus. The present study is, therefore, an attempt to evaluate and reappraise the taxonomic status and relationships of the genus and its species, and this paper reports progress to date.

EARLY RECOGNITION OF THE GENUS

Baldwin (1969) has pointed out that the first reference to the plants now referred to *Stewartia* undoubtedly appears in the Reverend Mr. John Clayton's early "Account of Virginia," which Clayton (1657–1725) included in a letter he wrote to Robert Boyle in 1687. The plants that Clayton described and distinguished from the dogwood (*Cornus florida* L.) were from a population near Williamsburg, Virginia, on Archers Hope Creek. It is evident from his characterization of the flowers and fruit that Clayton was describing a shrub having flowers with five petals and a gynoecium that develops into a strongly five-ribbed capsule. Furthermore, the Archers Hope Creek population is still extant (Grimes, 1922) and represents a disjunct Coastal Plain population of what is otherwise primarily a montane species in the southeastern United States.

Fifty-five years after the Reverend Mr. John Clayton had described the plants from the Archers Hope Creek population, Mark Catesby, the English traveler and naturalist, received a new shrub for his garden at Fulham from another John Clayton (1686–1773), an English naturalist

in Virginia who was apparently unrelated to the Reverend Mr. John Clayton. The plants flowered in May of 1742, and it is suspected that Catesby, recognizing their potential ornamental value as well as their botanical interest, gave plants of the new shrub to John Stuart, the third Earl of Bute, for the botanical garden he was helping to establish at Kew.

In addition to his gift of living plants to Catesby, the younger Clayton sent dried specimens of the new shrub to Gronovius at Leiden, one of which Gronovius forwarded to Linnaeus. The name *Stewartia*,[1] honoring John Stuart, was applied to the new genus by Linnaeus and was first published in 1746 (in the Acta Upsal. for the year 1741). Linnaeus stated that the description was based on Clayton's specimen as well as on the illustration (published with the description) drawn by George Ehret from plants in Stuart's garden and sent to Linnaeus by Isaac Lawson, a London physician.

Catesby himself included a plate of *Stewartia* in the *Appendix* to his *Natural History of Carolina, Florida, and the Bahama Islands* in the year following Linnaeus's publication.[2] Other than a few notes on the origin of his plants from Clayton, the text that accompanies the plate consists of a letter from John Mitchell (1680–1768), an English physician who had also traveled and collected in Virginia. In his letter to Catesby, Mitchell addresses himself to Linnaeus's description of the new genus.

Among other criticisms, Mitchell stated that *Malachodendron*, the name he used for the new genus, is characterized by five styles, not one, and that the strongly five-angled fruits dehisce apically. Mitchell also pointed out that the numerous stamens are united at the base and that, as a result, the genus properly belonged in class *Monadelphia Polyandria* where it formed a new tribe or order, *Pentagynia*, that separated it from malvaceous plants. The genus, appearing under the name *Malachodendron* and characterized in this manner, was later included by Mitchell in his *Dissertatio Brevis* of 1748.[3] Linnaeus, however, was unwilling to accept all of Mitchell's refinements, and in the *Species Plantarum* (1753) and *Genera Plantarum* ed. 5 (1754) complied only to the extent of including *Stewartia* in the class *Monadelphia Polyandria*. For the single species

[1] The spelling of the generic name consistently employed by Linnaeus is *Stewartia*, not *Stuartia*. Because of this invariance, it cannot be maintained under Art. 73 of the International Code of Botanical Nomenclature that Linnaeus's spelling contains an unintentional orthographic error, and the original spelling must be maintained. Cf. T. A. Sprague, Kew Bull. **1928**: 362. 1928 for the opposing viewpoint. Additional variant spellings include *Steuartia* and *Stevartia*.

[2] It is of interest to note that Stevenson [*Catalogue of Botanical Books in the Collection of Rachel McMasters Miller Hunt* 2(2): 144. 1961] attributes all but three plates in the *Natural History* to Catesby himself. The plate of *Stewartia* that was published by Linnaeus in 1746 and both attributed to and signed by Ehret is a small portion of the plate published by Catesby. If Catesby was indeed responsible for the plate appearing in the *Appendix*, as is indicated by his initials in the lower right-hand corner of the plate, it would seem that he enlarged upon the Ehret drawing.

[3] Mitchell's *Dissertatio Brevis*, republished in 1769, is acceptable as a valid publication for generic names. *Malachodendron*, as a genus, is usually attributed to Cavanilles, Diss. Bot. **5**: 302. *t. 158, fig. 2.* 1788, but is correctly attributed to Mitchell.

then known to him, he employed the binomial *Stewartia Malacodendron.*

It appears conclusive on the basis of the distributional and historical evidence summarized by Baldwin that Mitchell based his criticisms of Linnaeus's description on his observations of the plant that the Reverend Mr. John Clayton had discovered a half century earlier. Linnaeus based *Stewartia* on a second plant, a species that is essentially confined in distribution to the Atlantic Coastal Plain. Furthermore, both Clayton and Mitchell specimens of *Stewartia* are preserved at the British Museum, and it is clear that two taxa are represented. It is somewhat ironic that the first discovered species, known from a disjunct population, was rediscovered and described by Mitchell but was not accepted as distinct from *S. Malacodendron* until Cavanilles named the second species *Malachodendron ovatum* in 1788. Furthermore, according to Rees (1816), *S.* (*Malachodendron*) *ovata* essentially replaced *S. Malacodendron* as a favored ornamental in English gardens soon after its introduction in about 1785. Although some authors throughout the nineteenth century continued to accept *Malachodendron* as distinct from *Stewartia*, L'Héritier (1791) treated *M. ovatum* as a species of *Stewartia* (*S. pentagyna*), and there was a gradual acceptance of a single genus comprised of two species.

GENERIC RELATIONSHIPS

As subfamilial classifications and groupings of theaceous taxa were proposed periodically during the nineteenth century, *Stewartia* was generally associated with the superficially similar genus *Gordonia* Ellis. De Candolle (1824), recognizing both *Stewartia* and *Malachodendron* in the Ternstroemiaceae, aligned these genera with *Gordonia* in tribe Gordonieae DC., while *Camellia* L. and *Thea* L. were placed in a separate family, Camelliaceae. Choisy (1855), also recognizing two separate families, removed *Gordonia*, *Stewartia*, and *Malachodendron* to the Camelliaceae where *Stewartia* and *Malachodendron* were placed in a separate tribe, Stewartieae Choisy, on the basis of their gynoecia with ascending ovules, seeds with copious endosperm, and embryos with fleshy cotyledons. *Gordonia*, along with *Schima* Reinw. ex Bl. and *Laplacea* Kunth, was maintained in the Gordonieae, characterized by gynoecia with pendent ovules, seeds lacking endosperm, and embryos with foliaceous cotyledons.

Additional classifications were proposed as the genera comprising the Theaceae (as recognized today) were aligned with one another; these include the systems of Bentham & Hooker (1862), Szyszylowicz (1895), and Melchior (1925). The larger group of genera allied with *Stewartia* was recognized as forming a natural alliance, variously recognized as tribe Camellieae (DC.) Melchior or subfamily Camellioideae Airy-Shaw. The arrangement of genera within the tribe or subfamily, however, has been subject to debate, chiefly because of the criteria used in circumscribing the taxa. Fruit characters and those of the floral bracts, calyx, and corolla have been used in various combinations, resulting in numerous ar-

rangements of the genera (cf. Keng, 1962, for a comparison of the more recent classifications).

Airy-Shaw (1937) initially pointed out the potential significance of the use of anatomical criteria for definition of subfamilies in the Theaceae, which encouraged several re-evaluations of existing classifications (Airy-Shaw, 1936; Sealy, 1958). The most recent scheme, proposed by Keng (1962), combines a morphological approach with the results of his considerable anatomical investigations of theaceous genera. The synoptic key to the tribes and subtribes of the Camellioideae which follows serves to distinguish *Stewartia* from its allies as well as to illustrate the basic alignment of the subfamily proposed by Keng.

Key to the Tribes & Subtribes of the Camellioideae

A. Capsules lacking a persistent central columella; seeds wingless or narrowly winged; endosperm copious, embryos small, straight, with spatulate, flat cotyledons. Stewartieae. (*Stewartia*, incl. *Hartia*).

A. Capsules with a persistent central columella; seeds conspicuously winged or wingless; endosperm lacking or confined to a thin layer, embryos large, straight or slightly curved, with flat or longitudinally undulate cotyledons. Gordonieae. . . . . B.

B. Capsules woody, dehiscent, elongate or rounded; seeds winged (only rudimentary in *Franklinia*); endosperm forming a thin layer. . . . . C.

C. Capsules elongate, ovoid to elliptic; seeds ellipsoid, with an oblong wing at the upper end. Gordoniinae. (*Gordonia*, *Laplacea*).

C. Capsules globose or subglobose; seeds rounded, flattened, with a conspicuous thin marginal wing, or the wing rudimentary. Schimiinae. (*Schima*, *Franklinia*).

B. Capsules woody, or sometimes coriaceous or drupaceous, indehiscent, more or less rounded; seeds wingless; endosperm absent. Camellieae. . . . . D.

D. Seeds usually 1 (rarely 2 or more) per locule, rounded or rounded-cuneate; cotyledons thick. Camelliinae. (*Camellia*, sensu lato).

D. Seeds usually 2 or 2–4 per locule, ellipsoid, mutually compressed; cotyledons thin. Pyrenariinae. (*Pyrenaria*, *Tucheria*).

The relationship between *Stewartia* and *Hartia*, a genus proposed by Dunn in 1902 to accomodate a plant from Yunnan Province in southwestern China and included in tribe Stewartieae by Keng, has been the subject of periodic discussions. The similarities of the two genera were commented upon by Dunn, and more recently the integrity of *Hartia* has been debated by Cheng (1934), Chun (1934), Airy-Shaw (1936), Merrill (1938), Wu (1940), and Sealy (1958). Dunn asserted that *Hartia* is distinct from *Stewartia* on the basis of the greater connation of its anther filaments into a tube at the base of the androecium and by its more numerous seeds. Wu (1940), who supported maintaining *Hartia*, emphasized in addition that the foliage of *Hartia* is persistent and that the conspicuously winged or inflated petioles successively enclose the terminal buds of the shoots.

Except for the difference of evergreen versus deciduous foliage, the reputed generic distinctions between *Stewartia* and *Hartia* fail to hold on even a cursory examination of the supposed differences in *Stewartia* sensu stricto. The number of seeds (ovules) per locule in *Stewartia* is either two or four (or fewer through abortion), while in *Hartia* the number is four. Connation of the anther filaments into a tube is at best a variable qualitative character, yet in *S. rostrata* a tube up to 9 mm. long is present that equals or surpasses, both in length and in relative amount of connation, any found in species assigned to *Hartia*. Furthermore, the petiole character mentioned by Wu occurs also in a deciduous species; all species of *Stewartia* have narrowly winged, shallowly grooved petioles, but in *S. ovata* the groove is deeper and the wings are enlarged, resulting in the concealment of the axillary and terminal buds.

Moreover, Keng's studies of *Stewartia* and *Hartia* have shown a consistent anatomical coincidence between the species, several aspects of which distinguish these from other theaceous genera. All genera of the Camellioideae, with the exception of *Stewartia* and *Hartia*, have capsules with persistent central columellae; while the nearly basal axile placentation, ascending ovules, and seeds with copious endosperm characteristic of *Stewartia* and *Hartia* also set these genera apart. The distribution of sclereids within the leaves of *Stewartia* species is unique in the Camellioideae since the sclereids are restricted to the petiole and petiolar-wing region. The same distribution pattern and the same type of sclereid are also found in leaves of species of *Hartia*. The wood anatomy of both genera is also similar. Both develop distinct growth rings, have a tendency towards ring porosity with the numerous pores solitary or in pairs, and the phellogen arises in the pericycle or adjacent layers.

Considering the breakdown of the originally proposed generic characters and the additional evidence of close or identical anatomical structure, it seems only logical to include *Hartia* within *Stewartia*. There is precedent for this proposal, since *H. sinensis* Dunn has been treated as a species of *Stewartia* (as *S. pteropetiolata* Cheng). Although a review of the taxonomy and nomenclature of the evergreen species is currently in progress, and they have been taken into account in preparing the generic description, only the deciduous species of *Stewartia* sensu stricto are considered in the taxonomic treatment of the present paper.

That *Stewartia* in this broad sense is relatively isolated within the Camellioideae is indicated by its segregation in a separate monotypic tribe. Its isolation could be a function of its relatively great age; fossil flowers attributable to the genus have been recorded from amber deposits of middle Oligocene in Central Europe, while fossil leaves that match well the leaves of present-day *S. monadelpha* have been found in Japan (Schenk, 1890). Moreover, the present-day distribution of *Stewartia* in eastern North America and eastern Asia along with the fossil evidence points to a former wider distribution and consideration of *Stewartia* as an Arcto-Tertiary relict.

SUBGENERIC CLASSIFICATION

Several authors have proposed subgeneric classifications of *Stewartia* sensu stricto. Wu (1940) divided *Hartia* into sect. HARTIA (sect. *Euhartia* Wu, flowers solitary, axillary) and sect. RACEMOSA Wu (inflorescence a few-flowered axillary raceme). Cheng (1934), in transferring *H. sinensis* to *Stewartia*, recognized two sections in *Stewartia* (sects. STEWARTIA and HARTIA (Dunn) Cheng) having limits that coincide with the old generic boundaries; while Keng (1962), in anticipation of the transfer of additional species of *Hartia* to *Stewartia*, also advocated two sections defined along former generic lines. The obstacle preventing my recognition of two subgenera or sections based on the former generic lines is the dearth of characters supplementing the one consistent distinction between the two proposed taxa, viz. persistent foliage versus deciduous foliage. Other characters seem to be reticulate within the genus and fail to coincide with this single difference.

Within *Stewartia* sensu stricto generic subdivisions have been delimited primarily on the basis of characters of the gynoecium and those of the calyx and its subtending bracts. Gray (1849), following Endlicher (1840, 1842) (who failed to designate the rank of his subdivisions), divided the genus into subg. STEWARTIA (styles united, capsules subglobose, not rostrate, seeds smooth, wingless; including sect. *Adelphonema* Endl.[4]) and subg. MALACODENDRON (Mitchell) Gray (styles 5, distinct, capsules ovate, acuminate, seeds with wrinkled epidermis, winged) using as criteria the generic boundaries that had separated *Malachodendron* from *Stewartia*. Szyszylowicz (1895) employed the same criteria in establishing sect. DIALYSTYLA, to include *S. ovata*, and sect. SYSTYLA (sect. *Cavanilla* (Salisbury) O. Kuntze), comprised of *S. Malacodendron* and the Asiatic species, all with united styles. Nakai (1950), treating the Japanese-Korean species, established two additional sections, sect. PSEUDOCAMELLIAE Nakai to include *S. pseudocamellia* (bracts shorter than the calyx) and sect. SERRATAE Nakai (bracts and sepals subequal) for the remaining species of that region.

All of the proposed generic subdivisions of *Stewartia* sensu stricto isolate one species from the remainder of the genus, and the resulting classification only serves to indicate the uniqueness of particular species. Conceivably, each species could be distinguished from the remainder of the genus by inclusion in a separate subgenus or section. In part, this situation has resulted from the examination of species of a limited area, but my examination of the entire genus convinces me that relationships among the taxa (including species of *Hartia*) are reticulate. Moreover, the species fail to fall into distinct subgeneric categories based on coherent groups of characters worthy of taxonomic recognition.

[4] The rank of Endlicher's subdivision was assigned by Gray.

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FIGURE 1 is the exacting work of the late Dorothy H. Marsh, prepared for the *Generic Flora of the Southeastern United States*, a joint project of the Arnold Arboretum and Gray Herbarium of Harvard University made possible through the support of the National Science Foundation (Grant GB–6459X, principal investigator, Carroll E. Wood, Jr.) and reproduced here with the kind permission of Dr. Wood. FIGURE 2 was prepared by Virginia Savage, drawn for the most part from materials collected from living plants grown at the Arnold Arboretum, Jamaica Plain.

TAXONOMY

Stewartia Linnaeus, Sp. Pl. 2: 698. 1753; Gen. Pl. ed. 5. 311. 1754.

Malachodendron Mitchell, Diss. Brev. Bot. Zool. 38. 1769.
Stuartia L'Héritier, Stirp. Nov. 153. 1791.
Cavanilla Salisbury, Prodr. Stirp. Chapel Allerton 385. 1796, non J. F. Gmelin, 1791, nec Thunberg, 1795.
Hartia Dunn, Hooker's Icones Pl. 28: *t. 2727*. 1902.

Evergreen or deciduous trees or shrubs with closely fissured non-exfoliating or smooth, mottled, exfoliating bark; winter buds laterally compressed with 1 to several imbricate scales. Leaves alternate, chartaceous to coriaceous, short-petiolate, the petioles narrowly to widely winged, the wings sometimes enclosing and concealing the axillary and terminal buds; leaf blades ovate to lanceolate or elliptic with cuneate to rounded bases, serrulate to serrate margins, and acuminate, acute, or apiculate apices; venation pinnate, the midvein usually prominent and elevated on the adaxial surface; nodes unilacunar. Flowers perfect, solitary or occasionally 2 or 3 together, sometimes in a short, few-flowered axillary raceme, axillary or rarely terminal, pedicellate, with 1 or 2 persistent or rarely caducous bracts subtending the calyx. Sepals 5 (or 6), imbricate in bud and with overlapping margins at anthesis (quincuncial), subequal, persistent, connate and becoming lignified at the base. Petals 5, rarely 6–8,

white, connate at the base forming a very shallow tube; blades obovate with wavy, finely erose margins, the abaxial surfaces silky pubescent. Stamens numerous, the filaments basally connate and adnate to the base of the corolla, otherwise free or coherent for part of their length and forming a tube; filaments white, purplish, or yellowish; anthers versatile, yellow or bluish. Gynoecium (4) 5 (or 6)-carpellate, the styles connate or free, partially persistent in fruit, terminating in (4), 5, (or 6) stigmatic arms or a single crenate stigma; ovary syncarpous, superior, (4) 5 (or 6)-loculate, each locule with 2 or 4 erect ovules on nearly basal axile placentae. Fruit a woody, globose to ovoid, often strongly rostrate capsule, lacking a persistent central columella, loculicidally dehiscent from the apex or by the outward folding of the valve margins; capsules maturing in a single season, often remaining on the branches for 2 or more seasons. Seeds 2 or 4 per locule (or fewer through abortion), angular and wingless or planoconvex with a narrow marginal wing, obovate to subovate in outline, the testa crustaceous and shining or chartaceous and dull with a finely rugose or puncticulate surface; embryo small, straight, the cotyledons subrounded, clasping, embedded in copious fleshy endosperm; germination epigeal. Base chromosome number 15. TYPE SPECIES: *S. Malacodendron* L.

KEY TO THE DECIDUOUS SPECIES OF STEWARTIA

A. Styles 5, distinct; petioles widely winged, enclosing the lateral and terminal buds; floral bract 1. ..... 1. *S. ovata.*

A. Styles united, terminating in 5 or 6 stigmatic crests or arms; petioles narrowly winged, not enclosing the lateral and terminal buds; floral bracts 2. ..... B.

B. Stamens with purplish filaments and bluish anthers; capsules dehiscent by the outward folding of the valve margins, the apices of the valves ± coherent; seeds angular. ..... 2. *S. Malacodendron.*

B. Stamens with whitish filaments and yellow or orange anthers; capsules apically dehiscent, the valves spreading apart from the apex; seeds planoconvex. ..... C.

C. Floral bracts about equalling or longer than the calyx; small or large trees or shrubs with smooth or fissured bark; young branches usually terete, not zigzagged. ..... D.

D. Ovaries and/or capsules subglobose, completely glabrous or pubescent only at the very base. ..... E.

E. Ovaries and/or capsules completely glabrous; 2 ovules or seeds per locule; bark on older branches smooth and mottled. ..... 3. *S. serrata.*

E. Ovaries and/or capsules pubescent only at the very base; 4 ovules or seeds per locule; bark on older branches finely fissured. ..... 4. *S. rostrata.*

D. Ovaries and/or capsules conical, pilose or appressed-pubescent over the entire surface. ..... F.

F. Sepals oblong or ovate with acute apices. ..... G.

G. Floral bracts ovate, subequal to the sepals; styles 6–8 mm. long; seeds 7–9 mm. long. ..... 5. *S. sinensis.*

G. Floral bracts oblong, conspicuously longer than the sepals; styles 3–4 mm. long; seeds 5–6 mm. long. . . . . 6. *S. monadelpha.*

F. Sepals ovoid with rounded, ciliate apices. . . 7. *S.* × *Henryae.*

C. Floral bracts conspicuously shorter than the calyx; small trees with smooth, mottled bark; young branches usually compressed and zigzagged, rarely terete. . . . . 8. *S. pseudocamellia.*

1. **Stewartia ovata** (Cavanilles) Weatherby, Rhodora **41**: 198. 1939. FIGURE 1.

Malachodendron ovatum Cavanilles, Diss. Bot. **5**: 302. *t. 158, fig. 2.* 1788. TYPE: presumably at MA, but not seen.

Stewartia pentagyna L'Héritier, Stirp. Nov. 155. *t. 74.* 1791.

Stewartia montana Bartram, Travels 334. 1791.

Malachodendron pentagynum (L'Héritier) Dumont-Courset, Bot. Cult. ed. 2. **5**: 107. 1811.

Shrubs or small trees to 6 m., usually with several limbs from the base; periderm on young shoots silvery gray-brown, with long, longitudinal fissures, the bark non-exfoliating, grayish-brown, tight, with close, shallow fissures; winter buds small, 2–5 mm. long, with one pubescent scale en-

FIGURE 1. **Stewartia ovata.** a, flowering branchlet of forma *grandiflora* × 1/2; b, flower of forma *ovata*, × 1/2; c, apically dehiscent capsule with 5 persistent styles and persistent calyx, × 1 1/2; d, seed with winged margin and finely rugose surface, × 3.

closing the silvery-pubescent embryonic leaves. Leaf petioles 4–14 mm. long with winged margins, the margins enclosing and concealing the axillary and terminal buds; leaf blades ovate to ovate-lanceolate, (3–)7–15 cm. long, (2–)4.5–7(8.5) cm. wide, with acute to shortly acuminate apices, rounded bases, and ciliate, obscurely serrulate margins with apiculate teeth; upper surface of the blades glabrous, lower surfaces finely pubescent, particularly along the veins. Flowers axillary, pedicels short and stout, 3–4 mm. long; one bract subtending the calyx, foliaceous, 11–14 mm. long, 3.5–4.5 mm. wide, oblong with an acute apex, persistent. Sepals 5 (or occasionally 4), connate at base, 14–17 mm. long, 6–9 mm. wide, the free lobes lanceolate-oblong with acute apices and ciliate margins; sepals erect in bud, persistent, spreading-erect in fruit. Petals 5, free to the base, 2.8–4.2 cm. long, 2.2–3 cm. wide, obovate to suborbicular, margins erose and wavy. Stamens numerous, the filaments united into a short tube at base, 3–4 mm. long, adnate to the corolla, the free portions 10–12 mm. long above, white, yellowish, or rose; anthers yellow. Ovary conical, 5–6 mm. long at anthesis, irregularly 5-lobed, densely sericeous, particularly toward the base of the styles; styles 5, distinct, subequal, 12–14 mm. long, each terminating in a small capitate stigma. Capsules reddish brown, finely pubescent, particularly along the margins of the loculles, ovoid with truncate apices (the styles persistent at varying lengths) and strongly 4- or 5-angled, 18–22 mm. long, 14–16 mm. broad, apically dehiscent into 4 or 5 locules, the locule walls 6–7 mm. wide. Seeds 2 per locule, reddish brown, 8–10 mm. long, 5–7 mm. wide, plano-convex, obovate to oblong in outline, narrowly winged, the apex rounded or sometimes emarginate, the raised central portion finely rugose. $2n = 30$.

DISTRIBUTION: Known from the mountains and adjacent Piedmont of Kentucky, Tennessee, North and South Carolina, Georgia, and Alabama; occurring in two disjunct populations on the Coastal Plain of Virginia.

Representative specimens. **Alabama.** CHILTON Co.: Sand Mountain, *T. G. Harbison, s.n.* 20 VI 1905 (A); same locality, *T. G. Harbison, s.n.* 20 VI 1913 (A). CULMAN Co.: St. Bernard, *W. Wolf, s.n.* 25 VI 1934 (GH). DEKALB Co.: gorge of Town Creek, *R. M. Harper 4043* 12 IX 1947 (GH). FRANKLIN Co.: edge of sandstone gorge along Dismal Branch, *R. M. Harper 3398* 17 VI 1935 (A, GH). **Georgia.** FULTON Co.: West Paces Ferry Road over the Chattahoochee River, *H. Bookout, Jr. 35* 20 VI 1957 (GH); ravine slope near Sandy Springs, *E. T. Wherry, s.n.* 7 IX 1934 (A). MADISON Co.: S slope of Mill Shoal Creek, 1 mi. SE of Colbert at ca. 600 ft., *W. H. Duncan 11595* 4 VIII 1950 (GH). OCONEE Co.: slopes of wooded ravine ca. 3 1/2 mi. SE of Farmington, *W. H. Duncan 3794* 4 VIII 1941 (GH). RABUN Co.: rocky stream bank, 7 mi. S of Highlands, N.C., *T. G. Harbison 52 & 53* 1 VII 1918 (A, two sheets); canyon at Tallulah Falls at 1600 ft., *J. K. Small, s.n.* 15 VIII 1893 (A, GH). STEPHENS Co.: southern slope of Lee Mountain, *H. Bookout, Jr. 21* 8 VII 1956 (GH); bank of stream, Toccoa, *T. G. Harbison 10* 20 VI 1918 (A, two sheets). TOWNS Co.: near Hiawassee, *C. S. Sargent, s.n.* 28 IX 1885 (A). Without locality: C. *Wright, s.n.* 1875 (GH). **Kentucky.** BELL Co.: Clear Creek, *E. L. Braun 1580* 15 VII 1937 (A); along the Cumberland River, *T. H. Kearney 322* IX 1893 (A, GH). MCCREARY Co.: Yahoo Ridge, western edge of Cumberland Plateau, *E.*

L. Braun, s.n. 18 VI 1935 (GH). PULASKI CO.: Rockcastle Springs, *J. D. Smith, s.n.* 18 VIII 1883 (GH). **North Carolina.** MACON CO.: southern exposures of the Blue Ridge Mountains, *Biltmore Herb. 886b* 3 VII & 9 VIII 1897 (A, BM, GH, P); Highlands, *T. G. Harbison, s.n.* VI 1903 (GH). STOKES CO.: north-facing bluff of the Dan River N of Moore Springs, *W. B. Fox 5500* 30 IX 1951 (GH); same locality, *S. W. Leonard & D. B. Russ 2554* 1 VII 1969 (BM, GH, P). Without locality: *S. B. Buckley, s.n.* (BM, GH); *F. Rugel, s.n.* 1841 (BM); *C. S. Sargent, s.n.* 26 IX 1885 (A). **South Carolina.** OCONEE CO.: E side of W fork of Little River, 3 mi. SW of Salem at ca. 900 ft., *W. H. Duncan 11259* 8 VII 1950 (GH). **Tennessee.** BLOUNT CO.: Abrams Falls Trail, Cades Cove, *R. E. Shanks & A. J. Sharp 13184* 25 VI 1949 (GH). CUMBERLAND CO.: Cumberland Mountain, *A. Gattinger 408* (A, BM, GH). GRUNDY CO.: along stream below Altamont, *H. K. Svenson 7306* 9 VII 1935 (GH). KNOX CO.: Clinch Mountain above Lea Lakes near Blane, *H. M. Jennison, s.n.* 6 VII 1929 (GH). MARION CO.: Cumberland Plateau ca. 5 mi. SE of Sewanee at 1800 ft., *H. K. Svenson 8913* 22 VI 1938 (GH). MONROE CO.: Cherokee Natl. Forest, 1 mi. up North River Road toward Beech Gap, *M. H. Berry 16444* 29 VI 1952 (GH). POLK CO.: banks of the Ocoee River, *Biltmore Herb. 886c* 26 VIII 1897 (A, GH). RHEA CO.: near Rockwood, *D. M. Coffman, s.n.* 15 VI 1890 (A). SEQUATCHIE CO.: Eagle, *J. H. H. Boyd, s.n.* VII 1891 (A). SEVIER CO.: along road to Indian Gap and along Fightin' Creek Road, Lower Sugarlands Valley at 500 m., *H. M. Jennison & J. G. Smith, s.n.* 29 VI 1937 (GH); between Pitman's Center and Greenbrier, *A. J. Sharp, et al. 1963* 15 VII 1934 (BM). UNION CO.: near The Gourd, *Kelley 2105* 10 VII 1934 (GH). Without locality: *A. Gattinger, s.n.* 1879 (A, two sheets); *F. Rugel, s.n.* VI 1842 (BM); *A. Ruth 239* (GH); *C. S. Sargent, s.n.* 21 IX 1888 (A). **Virginia.** JAMES CITY CO.: Williamsburg, bluff above College Creek, $2n = 34$, *J. T. Baldwin 14951* 19 VI 1954 (GH); moist or dry hillsides, 1 1/2 mi. SE of Williamsburg, *E. J. Grimes 3818* 24 VI 1921 (GH). LANCASTER CO.: bank of John Creek, Merry Point, *W. J. Harley 2265* 18 VI 1960 (GH); same locality, *W. J. Harley 2272* 25 VIII 1960 (GH). Without locality: *J. Mitchell, s.n.* (BM); *Michaux, s.n.* (P).

Cultivated. **England.** SURREY: Royal Botanic Gardens, Kew, Richmond, *no collector* (BM). Without locality: Hortus Dickens, 14 IX 1916 (BM). **United States.** MASSACHUSETTS: Arnold Arboretum, plant from seed from Germantown, Pa., 1928, Acc. # 637–28, *E. J. Palmer, s.n.* 21 VI 1938 (AAH); plant grown from seed from New York Botanical Garden, 1933, Acc. # 313–34, *E. J. Palmer, s.n.* 11 X 1938 (AAH); plant from T. G. Harbison, Highlands, N.C., 1925, Acc. # 18244, *C. E. Kobuski, s.n.* 17 VII 1933 (AAH), *E. Murray 318* 7 IV 1965 (AAH); plant from H. F. Kelsey, Boxford, Mass., 1922, Acc. # 18847, *S. Kreps, s.n.* 10 VII 1964 (AAH), *G. P. DeWolf & P. Bruns 2175* (AAH); without data, 14 VII 1911 (AAH). Brookline: Hortus H. H. Richardson, *A. Rehder, s.n.* 13 VII 1921 (AAH, two sheets). Jamaica Plain: Hortus Dixwell, 25 IX 1882 (AAH); same locality, VIII 1885 (GH); Hortus F. Parkman, 18 VII 1889 & 25 III 1896 (AAH, two sheets). South Lancaster: Hortus Mrs. Bayard Thayer, *E. H. Wilson, s.n.* 24 VII 1927 (AAH, two sheets). NEW YORK: Pecks Mill, *L. Lundquist, s.n.* 17 VII 1937 (AAH). NORTH CAROLINA: Shortia Gardens, Highlands, *T. G. Harbison, s.n.*, V 1903 (GH). PENNSYLVANIA: Morris Arboretum, Acc. # 62–116, *J. M. Fogg, Jr., s.n.* 29 VI 1967 (AAH).

Stewartia ovata is easily distinguished from other deciduous species of *Stewartia* by its winged petioles that enclose and conceal the terminal and lateral buds. In this respect, *S. ovata* is more closely allied to the

evergreen Asiatic species that have been treated as species of *Hartia* than are other deciduous species. This taxon is also unique within the genus due to its gynoecium with five distinct styles and its one floral bract that subtends the calyx.

Plants with flowers having purple rather than yellowish-white stamen filaments and with five to eight petals have been recognized as forma *grandiflora* (Bean) Kobuski. Baldwin (1969, 1970), however, reported flowers with stamen filaments ranging in color from white through rose to purple from the James City County population on the Virginia Coastal Plain and questioned whether this variation was a result of introgressive hybridization between *S. ovata* and *S. Malacodendron*, the flowers of which normally have purple stamen filaments. Wood (1957) and Kobuski (1959) commented on this color variation and noted the range from white to light purple in the same and in different flowers of a single plant of *S. ovata* from Highlands, North Carolina, cultivated at the Arnold Arboretum. They attributed the variation to genetic instability similar to that known in some *Camellia* cultivars. Inasmuch as additional evidence supporting introgression is lacking, somatic mutation seems to be the most plausible explanation.

In the citation of herbarium specimens, sheets of forma *grandiflora* have been included with sheets of forma *ovata* since stamen filament color does not preserve well and the number of petals in flowers of forma *grandiflora* is variable and often difficult to determine in pressed specimens. A presentation of the nomenclature and synonymy of forma *grandiflora*, which is of some importance horticulturally, follows this discussion.

Although *Stewartia ovata* was first described by Mitchell as the basis for the genus *Malachodendron*, the combination *M. ovatum* was first made by Cavanilles. The specimen on which this name is based is presumably preserved at Madrid. However, in his protologue Cavanilles refers only to living plants he observed at Trianon Palace and cites Mitchell's publication. If a specimen studied by Cavanilles is not preserved at Madrid the plate published by him might be designated as lectotype. Before this problem can be resolved, however, the collections at Madrid must be examined.

1a. **Stewartia ovata** (Cavanilles) Weatherby forma **grandiflora** (Bean) Kobuski, Jour. Arnold Arb. **40**: 419. 1959.

Stewartia ovata (Cavanilles) Weatherby var. *grandiflora* (Bean) Weatherby, Rhodora **41**: 198. 1939.
Stewartia pentagyna L'Héritier var. *grandiflora* Bean, Trees & Shrubs Hardy Brit. Isles ed. 1. **2**: 555. 1914.
Malachodendron pentagynum (L'Héritier) Dumont-Courset var. *grandiflorum* (Bean) Ashe, Torreya **31**: 41. 1931.

Differs from forma *ovata* in its corolla comprised of 5 to 8 petals and in its purple stamen filaments.

2. **Stewartia Malacodendron** Linnaeus, Sp. Pl. 2: 698. 1753. HOLOTYPE: *Clayton 734* (LINN, No. 876.1; IDC 177. 469: III. 2.); isotypes (BM, two sheets!).

Stewartia virginica Cavanilles, Diss. Bot. **5:** 303. *t. 159, fig. 2.* 1787.
Cavanilla florida Salisbury, Prodr. Stirp. Chap. Allerton 385. 1796.
Stuartia nobilis Salisbury, *Ibid.* 386.
Stewartia marilandica Donn ex Haworth, Andr. Bot. Repos. **6:** *t. 397.* 1804.
Malachodendron monogynum Dumont-Courset, Bot. Cult. ed. 2. **5:** 106. 1811.

Shrubs or small trees to 7 m.; young branches pubescent, the periderm reddish brown, flaking in irregular longitudinal strips; bark tight, close, silvery gray, non-exfoliating; winter buds compressed, 5–9 mm. long, with 2 densely silvery-pubescent imbricate scales. Leaf petioles 2–4 mm. long, shallowly grooved on the adaxial surface; leaf blades (2.5–)5.5–11 cm. long, (1.1–)2.5–5 cm. wide, ovate to elliptical with acute or acuminate apices, cuneate to attenuate bases, and finely serrulate, obscurely ciliate margins; upper surfaces of the blades glabrous, the lower surfaces finely appressed-pubescent, particularly along the midveins. Flowers axillary, the pedicels short, up to 5 mm. long; bracts subtending the calyx 2, ovate to suborbicular, 2–4 mm. long, 2–4 mm. wide, with short apiculate apices, persistent. Sepals 5, connate at base, 8–11 mm. long, 5–9 mm. wide, the free lobes suborbicular to obovate with ciliate margins and apiculate apices, persistent and reflexed in fruit. Petals 5, connate at base, (3–)4–5 cm. long, 3–4(–4.9) cm. wide, obovate to suborbicular in outline with entire or erose, wavy margins, the abaxial surfaces sericeous toward the base. Stamens numerous, the filaments purple, connate at base forming an ill-defined tube ca. 1 mm. long, the tube entirely adnate to the base of the corolla; free portions of the filaments up to 10 mm. long, pubescent at base; anthers bluish. Ovary ca. 5 mm. long at anthesis, subglobose, 4- or 5-angled, densely sericeous, the style glabrous, 3–5 mm. long, terminated by 4 or 5 stigmatic crests. Capsules woody, reddish brown, finely appressed pubescent, subglobose, 4- or 5-angled, often broader than long, 12–16 mm. long, 12–18 mm. broad, with apiculate apices, the base of the deciduous style projecting 1–1.5 mm. from the apex of the capsule; capsule dehiscing into 4 or 5 locules, by the outward and backward folding of the lateral margins of the valve walls, the apices of the valves remaining coherent or only slightly separated, one or two of the valves rarely deciduous. Seeds 2 or 4 per locule (or fewer through abortion), 5–7 mm. long, 4–6 mm. wide, angular, ovate to subovoid in outline, wingless, lustrous purplish or reddish brown. $2n = 30$.

DISTRIBUTION: Occurring in scattered localities on the Coastal Plain and Piedmont in the southeastern United States from Virginia to Florida and west to Mississippi, Louisiana, and Arkansas; known from two localities in the mountains of North Carolina and recently discovered in Newton County in eastern Texas.

Representative specimens. **Alabama.** BUTLER Co.: 3 mi. SW of Greenville,

R. M. Harper 98 20 VI 1906 (GH). TUSCALOOSA CO.: Tuscaloosa, *E. A. Smith, s.n.* 22 V 1884 (A). **Arkansas.** OUACHITA CO.: Camden, *A. Fendler, s.n.* 19 V 1850 (GH). **Florida.** CALHOUN CO.: Chipola River, E of Clarksville, *R. K. Godfrey 56339* 3 IV 1958 (GH); 7 mi. S of Alta, *R. K. Godfrey 62701* 7 IV 1963 (GH). ESCAMBIA CO.: Pensacola, *Clifton, s.n.* (BM). GADSDEN CO.: Rocky Comfort Creek N of Lake Talquin, *R. K. Godfrey & W. D. Reese 54724* 7 V 1956 (GH); same locality, *R. K. Godfrey & R. Kral 54969* 7 VII 1956 (GH). JACKSON CO.: Round Lakes, *T. G. Harbison, s.n.* 27 V 1916 (A). LIBERTY CO.: Apalachicola River near Allum Bluff, *E. J. Palmer 38546* 11 IV 1931 (A). OKALOOSA CO.: Big Creek, W of Laurel Hill, *R. K. Godfrey 61291* 2 VIII 1961 (GH). SANTA ROSA CO.: Escambia River slope W of Jay, *R. K. Godfrey & H. Kurz 54758* 10 V 1956 (GH). WALTON CO.: deep ravines and steep hillsides near Eucheeanna, *E. J. Palmer 38605* 14 IV 1931 (A); 14 mi. NE of DeFuniak Springs, *D. Plank, E. West, & L. E. Arnold, s.n.* 6 V 1948 (GH); same locality, *D. Plank & E. West, s.n.* XII 1948 (GH); 8 1/2 mi. S of DeFuniak Springs, *R. R. Smith 2337* 7 V 1968 (GH); 8 mi. W of Portland, *E. L. Tyson, s.n.* 26 V 1952 (GH). Without locality: *W. Baldwin, s.n.* (GH); *A. W. Chapman, s.n.* 1845 (BM, GH). **Georgia.** BULLOCH CO.: Lott's Creek, 7 1/2 mi. SW of Statesboro, *G. P. DeWolf & J. A. Boole 1674* 22 VIII 1961 (GH); Lower Lott's Creek, *K. Ussery 192* 5 V 1962 (GH). CALHOUN CO.: along Ichawaynochaway Creek 3 mi. W of Leary, *R. F. Thorne & W. C. Muenscher 7990* 5 IV 1948 (GH). CANDLER CO.: ca. 3 mi. E of Metter, *W. H. & M. B. Duncan 3964* 24 VIII 1941 (A, GH); open woods, Salem Church, 2 mi. NE of Metter, *E. T. Wherry, s.n.* 4,5 VII 1936 (GH). HANCOCK CO.: Spring Creek, 9.1 mi. E of Milledgeville, *W. H. Duncan 11024* 2 VI 1950 (GH). SCREVEN CO.: SE portion of county, *D. Eyles 6936* 12 V 1940 (GH). Without locality: *T. G. Harbison 1150* 13 V 1913 (A, two sheets). **Louisiana.** ORLEANS PARISH: New Orleans, *T. Drummond 204* 1832 (BM). ST. TAMMANY PARISH: Covington, *R. S. Cocks, s.n.* IV 1900 (A). Without locality: *S. B. Buckley, s.n.* (BM); *M. Carpenter, s.n.* (GH); *J. Hale, s.n.* (GH). **Mississippi.** FORREST CO.: Hattiesburg, *T. G. Harbison 10* 19 V 1915 (A). GEORGE CO.: plant 10 ft. tall, University of Mississippi Forest land near Benndale, *D. Demaree 34934* 25 IV 1954 (GH). PERRY CO.: woods along Tallahala Creek near Runnelstown, *S. B. Jones, Jr. 5195* 4 V 1966 (GH). **North Carolina.** CRAVEN CO.: W of New Bern, *T. G. Harbison, s.n.* 20 IV 1919 (A). DUPLIN CO.: Coshen Swamp, 3 mi. SW of Kornegay, *H. E. Ahles & G. Ramseur 24063* 27 IV 1957 (GH). HERTFORD CO.: pine-hardwood forest 2 mi. W of Camp P-D, *F. W. Woods & D. E. Moreland 731* 26 VIII 1948 (GH). JONES CO.: hardwood forest on Island Creek, *A. E. Radford 6649* 30 VIII 1952 (GH). ONSLOW CO.: near New River 2 mi. SW of Green Branch, *D. E. Moreland, s.n.* 22 V 1948 (GH). PASQUOTANK CO.: 1 mi. S of Elizabeth City, *K. M. Wiegand & W. E. Manning 1977* 17 VI 1927 (GH). **South Carolina.** BEAUFORT CO.: SW of Middleton Gardens, ca. 15 mi. NW of Charleston, *W. H. Duncan 6024* 11 V 1944 (GH); near Bluffton, *J. H. Mellichamp, s.n.* (A, three sheets). DORCHESTER CO.: near Dorchester, *J. H. Mellichamp, s.n.* 1889 (A). GEORGETOWN CO.: shady woods near Andrews, *T. G. Harbison, s.n.* 26 IV 1918 (A). **Texas.** NEWTON CO.: Little Cow Creek E of Old Hemphill Road, ca. 15 mi. NW of Burkeville, *D. S. Correll, et al. 29632* 16 V 1964 (GH). **Virginia.** ACCOMAC CO.: Messongo Creek, *E. Mears, s.n.* V 1886 (GH). NORFOLK CO.: rich woods near Gertie, *M. L. Fernald & L. Griscom 4455* 7 V 1935 (A, GH); Great Dismal Swamp W of Yadkin, *M. L. Fernald & B. Long 11078* (GH); same locality, *M. L. Fernald & B. Long 12131* 11 VI 1940 (GH); 10 mi. S of Norfolk,

E. B. Harger 419 28 V 1900 (GH). PRINCESS ANN CO.: wet woods near Pungo, *M. L. Fernald & B. Long 10726* 22 VII 1939 (GH). Without locality: *J. Clayton, s.n.* (BM, two sheets, LINN); *Michaux, s.n.* (P).

Cultivated. **New York:** Oyster Bay, Long Island, Hortus H. de Forest, *A. Rehder, s.n.* 9 IX 1921 (AAH, two sheets). **Pennsylvania:** Germantown, Hortus W. J. Campbell, *W. J. Campbell, s.n.* 6 VI 1935 (AAH). **South Carolina:** Hartsville, Hortus W. C. Coker, *E. J. Palmer 42378* 18 V 1934 (AAH). **Virginia:** Wachapreague, Hortus Mrs. J. M. Durbin, *J. M. Durbin, s.n.* 14 IX 1967 (AAH).

Stewartia Malacodendron appears isolated within the genus and is remarkably uniform throughout its range. It is recognized in flower by its androecium with purplish stamen filaments and bluish anthers. The capsules of *S. Malacodendron* are distinct in their dehiscence which occurs by the outward and backward folding of the lateral margins of the valves at the sutures between the valves. Seeds of *S. Malacodendron* are also diagnostic; their angular shape and the dark, smooth, and shining seed coat are not repeated elsewhere in the genus.

Although primarily a species of the Coastal Plain in the southeastern United States, where it inhabits low rich woodlands, usually along stream banks and on ravine slopes, *Stewartia Malacodendron* is also known from a few localities on the Piedmont and in the mountains of North Carolina in Avery and Macon Counties. Its range overlaps that of *S. ovata*, but sympatric populations are not known.

Of the specimens that Clayton sent to Gronovius, one, sent by Gronovius to Linnaeus, is in the Linnaean Herbarium in London, while two additional specimens are preserved at the British Museum.

3. **Stewartia serrata** Maximowicz, Bull. Acad. Sci. St.-Pétersb. III. 11: 430. 1867; Mél. Biol. Acad. Sci. St.-Pétersb. 6: 201. 1867, "*Stuartia*." HOLOTYPE: presumably at LE, but not seen.

Stewartia serrata var. *sericea* Nakai, Bull. Natl. Sci. Mus. Tokyo **29:** 93. 1950. HOLOTYPE: *S. Okuyama, s.n.* (TNS, sheet #80681!).

Stewartia serrata forma *sericea* (Nakai) Hara, Enum. Spermatophytarum Japon. **3:** 169. 1954.

Stewartia epitricha Nakai, Bull. Natl. Sci. Mus. Tokyo **29:** 92. 1950. HOLOTYPE: *Z. Tashiro, s.n.* (TNS, sheet #18654!).

Stewartia serrata var. *epitricha* (Nakai) Ohwi, Bull. Natl. Sci. Mus. Tokyo **33:** 79. 1953; Fl. Jap. 775. 1953, invalid, basionym not cited.

Stewartia serrata forma *epitricha* (Nakai) Ohwi, Fl. Jap. English ed. 629. 1965, invalid, basionym not cited.

Small trees to 10 m. (?); periderm on young shoots exfoliating in thin strips or flakes, the young branchlets finely pubescent, slender, grayish and reddish brown; bark on older limbs smooth, reddish brown, exfoliating; winter buds compressed, 4–6 mm. long with 2 reddish-brown, marginally ciliate, imbricated scales. Petioles (2–)5–12 mm. long, shallowly grooved on the adaxial surface; leaf blades ovate to lanceolate or oblanceolate, (1.7–)2.5–7.5 cm. long, (1–)1.4–2.6 cm. wide, with acuminate apices,

serrulate and often ciliate margins with inwardly curved teeth, and cuneate to attenuate bases; upper surfaces of the blades glabrous or with few scattered hairs, lower surfaces glabrous or with hairs along the midvein, sometimes with tufts of hairs in the axils of the midvein and lateral veins. Flowers axillary, pedicels 4–5(–7) mm. long; bracts subtending the calyx 2, foliaceous, often flushed with red, subopposite, lanceolate with acute apices and undulating, finely serrulate margins, 13–17 mm. long, 7–9 mm. wide, eventually deciduous in fruit. Calyx of 5 basally connate sepals, often suffused with reddish pigment, the free lobes essentially like the bracts in outline, erect or spreading in bud, lanceolate with acute to apiculate apices and undulating, serrulate margins, (12–)19–25 mm. long, 8–10 mm. wide; calyx becoming lignified at base, erect to spreading in fruit, eventually deciduous. Petals 5, connate at the base, obovate to suborbicular with erose margins and cuneate bases, (25–)30–33 mm. long, 20–25 mm. wide, the abaxial surface finely sericeous and sometimes (?) suffused with reddish pigment at the base. Stamens numerous, the filaments up to 25 mm. long, connate at the base, forming a tube 7–8 mm. long, the entire tube adnate to the base of the corolla, the free portions of the filaments finely pubescent at the base; anthers yellow. Ovary subglobose, 5-angled, glabrous, 3–4 mm. long at anthesis, tapering into a glabrous style, 17–20 mm. long, terminating in 5 very short stigmatic arms 0.5–1 mm. long, the arms marginally ciliate and often appearing connate. Capsules reddish brown, (13–)16–18 mm. long, (12–)14–17 mm. wide, completely glabrous, subglobose, 5-angled, with short rostrate apices, the style deciduous nearly at the apex of the ovary; capsule dehiscing into 5 locules, the locule walls 6–9 mm. wide. Seeds 2 per locule, 9–12 mm. long, 5–7 mm. wide, planoconvex, obovate in outline, oblique at the notched base with a narrow wing surrounding the raised central portion, reddish brown, the surface finely puncticulate. $2n = 30$.

DISTRIBUTION: Known from scattered localities in mountainous areas of southcentral Honshu, Shikoku, and Kyushu Islands, Japan; cultivated in western gardens.

Representative specimens. **Honshu.** PREF. KANAGAWA: Mt. Tanzawa, *Y. Hayashi, s.n.* 20 VII 1956 (TNS); Mt. Kamiyama, *I. Hurusawa 1479* 22 X 1951 (A); Yokohama, *Maximowicz, s.n.* 1862 (GH, P, a mixed collection with *S. monadelpha*); Mt. Kamiyama, in *Fagus* forest, *M. Mizushima 706* 28 XI 1950 (A); same locality, rather common in forest, *M. Mizushima 1617* 22 X 1951 (A); Mt. Tanzawa, *S. Okuyama 20189* IX 1962 (TNS); Mt. Komagatare (?), *K. Sakurai, s.n.* 9 VII 1910 (A); Mt. Kozukayama, *T. Sawada 2177* 20 VI 1927 (A); Mt. Komagatake, *E. H. Wilson, s.n.* (A). PREF. SHIZUOKA: Mt. Amagi, *G. Hashimoto, s.n.* 18 VIII 1932 (TNS); same locality, *Y. Hayashi, s.n.* 7 VII 1951 (TNS); same locality, in summer-green forest, *M. Mizushima 2453* 22 X 1953 (A); Abe-tôge, *S. Okuyama, s.n.* 22 VII 1939 (TNS); Mt. Amagi, *T. Sawada 2219* 2 VIII 1927 (A). **Kyushu.** PREF. FUKUOKA: Mt. Hiko at 1000 m., *J. Ohuchi, s.n.* 24 VI 1951 (TNS). PREF. KUMAMOTO: Mt. Ichifusa, *T. Suzuki, s.n.* 14 VII 1957 (TNS); same locality, *Z. Tashiro, s.n.* 29 VIII 1908 (TNS). PREF. MIYAZAKI: Shiiba-mura, Higashiusuki-gun, *D. Shimizu 116280* (TNS). PREF.

NAGASAKI (or Pref. Fukuoka ?): Mt. Hikosan, *Maximowicz, s.n.* 1863 (BM, two sheets, K, P, US). **Shikoku.** PREF. TOKUSHIMA: Mt. Tsurugi, *K. Abe, s.n.* 19 VIII 1930 (TNS); same locality, *K. Abe, s.n.* 25 VII 1947 (TNS); same locality, *J. Nikai, s.n.* 13 VIII 1904 (TNS); same locality, no collector, VIII 1909 (E).

Cultivated. **England.** SUSSEX: Borde Hill, *A. B. Jackson, s.n.* 19 VI 1939 (BM); Horsham, Hortus E. G. Loder, Leonardslee, *E. G. Loder, s.n.* 23 VI 1915 (K); same locality, *E. G. Loder, s.n.* 12 VI 1917 (K). SURREY: Royal Botanic Gardens, Kew, Acc. # 130–98–13001, *W. T. Gillis, s.n.* VI 1973 (AAH). **United States.** CONNECTICUT: The Conde Nast Garden, Greenwich, no collector, 21 VI 1938 (AAH, two sheets). MASSACHUSETTS: Arnold Arboretum, plant from Royal Botanic Gardens, Kew, 1938, Acc. # 615–38, *E. J. Palmer, s.n.* 21 VI 1938 (AAH). PENNSYLVANIA: Morris Arboretum, plant from F. D. Moore & Sons, Acc. # 62–96, *J. M. Fogg, Jr., s.n.* 11 VII 1962 (MOAR).

Maximowicz based *Stewartia serrata* on a collection from Mt. Hikosan on the island of Kyushu, Japan, and the holotype is presumably in Maximowicz's herbarium at Leningrad. Included in the collections examined in the present study are four sheets of *S. serrata*, one each at K and US, and two at BM, which were collected at the type locality by Maximowicz in 1863. These sheets are undoubtedly authentic material, presumably isotypes, but such designation must await examination of the Leningrad collections.

Variable in foliage indumentum, *Stewartia serrata* is otherwise relatively invariable in other foliage and floral characters. Nakai, studying the Japanese and Korean representatives of the genus, segregated *S. epitricha* from *S. serrata* on the basis of a finely pilose indumentum on the surfaces of the leaves and along the veins. Furthermore, he recognized as var. *sericea* of *S. serrata* those plants with sericeous pubescence along the veins on the lower surfaces of the leaves. Leaves of *S. serrata* are, however, generally glabrescent; the young leaves are usually characterized by a sericeous-pilose indumentum, and the species and variety recognized by Nakai appear to be artificial segregates based on differences that are probably environmentally induced and within the genetic potentiality of *S. serrata*.

Stewartia serrata is most closely related to the Chinese *S. rostrata*, from which it differs in its smooth, exfoliating bark, its completely glabrous gynoecium and capsules, and its 5-loculate ovary with two ovules and/or seeds per locule. From *S. monadelpha*, the only other Japanese species with which it might be confused, *S. serrata* differs in its small winter buds with two overlapping scales, its larger flowers with the subtending floral bracts and sepals similar in size and shape, and in its subglobose, entirely glabrous gynoecium and capsules.

4. **Stewartia rostrata** Spongberg, sp. nov. FIGURE 2, a–e.

Species distincta, *Stewartiae serratae, S. monadelphae*, et *S. sinensi* affinis, sed ex his speciebus facile distinguenda periderma non exfoliata, et cortice arcto cum fissuris approximatis et non profundis. Differt a *S. serrata* pubescentia sericea basi ovario capsulaque et quattuor ovulis vel

seminibus in loculis omnibus; a *S. monadelpha* et *S. sinense* ovario subgloboso vel globoso sericeo non nisi in basi vera et capsula globosa vel subglobosa basi sericea apice valde rostrata.

Shrubs or small trees with ascending branches to ca. 10 m., usually with several branches from the base; periderm on young growth non-exfoliating, the bark slate-gray, tight with close shallow fissures; winter buds compressed, ca. 5 mm. long with 2 or 3 finely pubescent imbricated scales. Petioles (2–)4–6(–9) mm. long, shallowly grooved on the adaxial surface; leaf blades ovate to elliptic, (2–)6–10.5 cm. long, (1.2–)2.5–4.5 cm. wide,

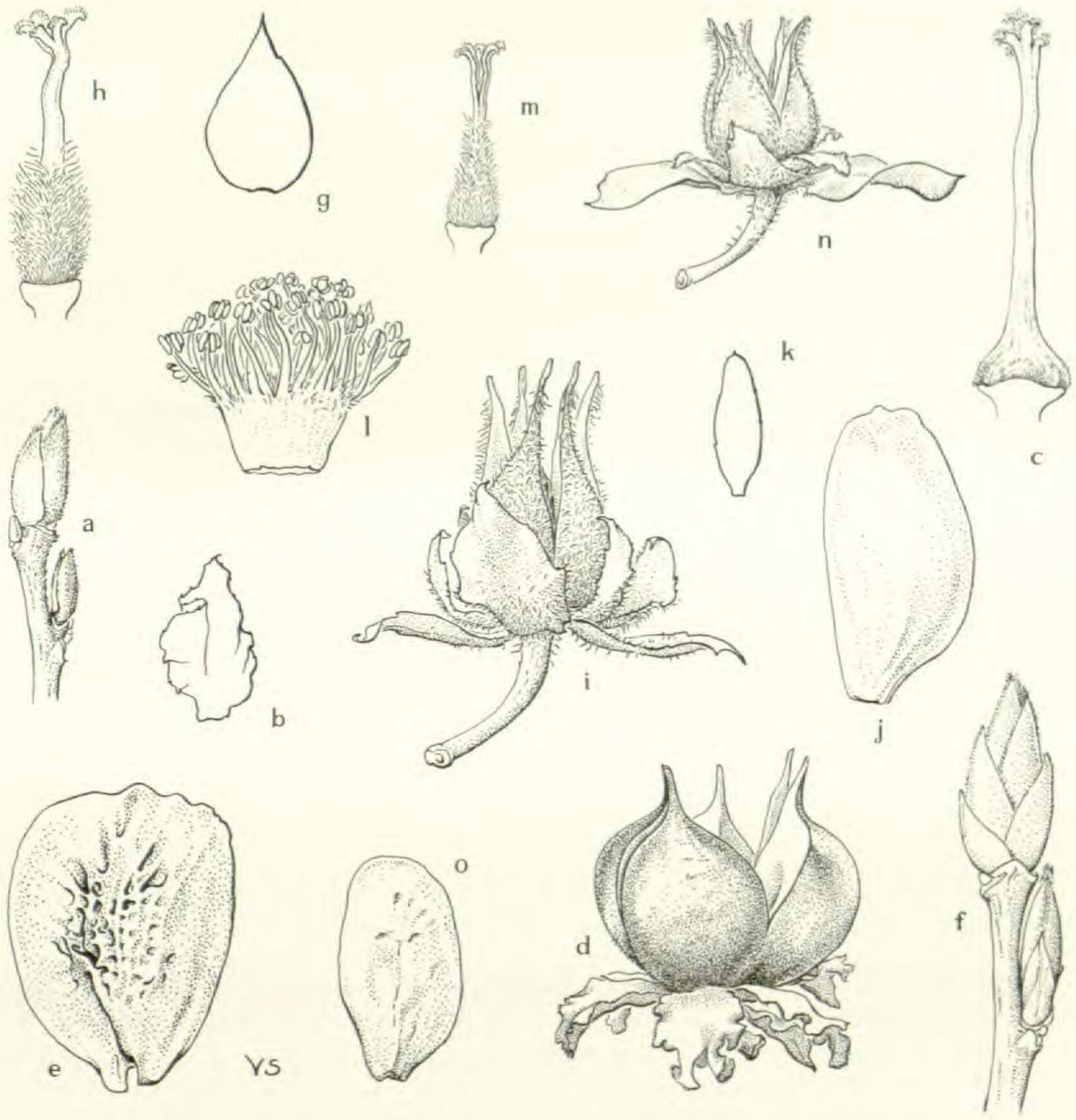

FIGURE 2. **Stewartia.** a–e, *S. rostrata*: a, dormant winter buds, × 2; b, floral bract, × 2; c, gynoecium with pubescence only at base of ovary, × 2; d, dehisced capsule with persistent floral bracts and calyx, × 1 1/2; e, seed, × 4. f–j, *S. sinensis*: f, dormant winter buds, × 2; g, floral bract, × 2; h, gynoecium, × 2; i, dehisced capsule with persistent floral bracts and calyx, × 1 1/2; j, seed, × 4. k–o, *S. monadelpha*: k, floral bract, × 2; l, androecium, × 2; m, gynoecium, × 2; n, capsule with persistent floral bracts and calyx, × 1 1/2; o, seed, × 4.

with acuminate apices, rounded bases, and serrate margins, the teeth with apiculate tips; lower surfaces of the blades with scattered long hairs, particularly on the elevated midvein, and with tufts of short hairs in the axils of the midvein and lateral veins. Flowers axillary, pedicels 5–7 mm. long; bracts subtending the calyx foliaceous, subopposite, (12–) 15–20 mm. long, (6–)8–12 mm. wide, ovate with a acuminate apices and irregularly undulating margins, persistent. Sepals 5, connate at the base, the free lobes similar to the bracts in outline, ovate to obovate or orbicular with acute or sometimes rounded apices and irregularly undulating margins, 12–18 mm. long, 7–10 mm. wide; sepals persistent, the calyx becoming lignified at the base, in fruit spreading or strongly reflexed beneath the capsule, often clasping the twig below. Petals 5, connate at the base, 2.8–3.8 cm. long, 2–3 cm. wide, obovate to suborbicular with erose margins and cuneate bases, the abaxial surfaces finely sericeous. Stamens numerous, the filaments up to 25 mm. long, connate at the base into a tube 6–9 mm. long, the tube adnate to the corolla; free portions of the filaments finely pubescent at base; anthers yellow. Ovary subglobose or globose, 5- or 6-angled, densely sericeous at the base, glabrous above, ca. 3 mm. long at anthesis, tapering into a glabrous style; styles 16–18 mm. long, terminating in 5 or 6 marginally ciliate stigmatic arms, each arm ca. 1.5 mm. long. Capsules subglobose or globose with a rostrate apex, strongly 5- or 6-angled, the body of the capsule 12–16 mm. long, 14–16 mm. broad with the persistent portion of the style projecting 5–8(–10) mm. above; capsule finely and obscurely pubescent at the base, brownish with a purplish red apex at maturity, becoming dark, blackish brown with age, dehiscing apically into 5 or 6 locules, the locule walls 7–9 mm. wide. Seeds 4 per locule, planoconvex, 8–10 mm. long, 6–7 mm. wide, obovate in outline, notched at the base and narrowly winged, the wing ca. 2 mm. wide at the apex; raised central portion finely rugose, yellowish brown, becoming reddish- or chestnut-brown.

HOLOTYPE: rare tree in thicket near stream, Niushiung-an, Mo-fou-shan, Hunan Province, China, 10 September 1947, *Y. K. Hsiung 05819* (A).

DISTRIBUTION: Moderate elevations in the mountains of Chekiang, eastern Hunan, and Kiangsi Provinces, China; cultivated in western gardens.

Representative specimens. **China.** CHEKIANG PROVINCE: Tien Tai Shan, tree 40 ft. along stream side, *C. Y. Chiao, s.n.* 22 VII 1927 (A, E, US); no definite locality, tree at side of stream to 8 m. with brownish green bark, *R. C. Ching 5177* 23 VIII 1924 (A); Tien-moo-shan, shrub to 6 m., bark dim gray, *R. C. Ching 5059* 18 VIII 1924 (A); Tihtaishan, at 600 to 1200 m., *R. C. Ching 1533* 5–18 V 1924 (P). KIANGSI PROVINCE: Hushan, Forest Station, *R. C. Ching 4795* (A, K); Lushan Mountains at 700–800 m., *H. H. Chung & S. C. Sun 574* 17 VII 1933 (A); Lushan Mountains, *H. H. Hu 2654* VIII 1934 (A); roadside, Russian Valley, *A. N. Steward 2735* (A, US); Kuling, *E. H. Wilson 1722, in part* 31 VII 1907 (A, two sheets, BM, E, two sheets, GH, US).

Cultivated. **United States.** MASSACHUSETTS: Arnold Arboretum, plant grown from seed received from Lu Shan Arboretum, Kiukiang, China, 1936, Acc. # 769–36, *A. C. Gibson 769* 16 VI 1969 (AAH), *W. Judd, s.n.* 9 IV 1937 (AAH),

E. Murray 314 7 IV 1965 (AAH, MOAR), *E. J. Palmer, s.n.* 12 VI 1939, 3 X 1940 (AAH). PENNSYLVANIA: Barnes Arboretum, Merion, *J. M. Fogg, Jr., s.n.* 22 VI 1962 (MOAR), *J. M. Fogg, Jr., s.n.* 6 VIII 1962 (MOAR), *J. M. Fogg, Jr., s.n.* 3 VII 1967 (MOAR); Morris Arboretum, Acc. # 57–544, *J. M. Fogg, Jr., s.n.* 11 VII 1962 (MOAR), *J. M. Fogg, Jr., s.n.* 1 IX 1964 (MOAR).

It seems appropriate that the specific epithet of this previously unrecognized species of *Stewartia* emphasize its strongly rostrate capsules that often remain on the branchlets for more than a year after maturation and dehiscence. First collected by E. H. Wilson in Kiangsi Province, China, under his number 1722, specimens of *S. rostrata* became mixed with specimens of *S. sinensis* collected by Wilson under the same number. This collection was cited by Rehder and Wilson when they described *S. sinensis*, and their circumscription included some elements of *S. rostrata*. Additional details of the taxonomic and nomenclatural confusion are discussed under *S. sinensis*.

TABLE 1. **Comparison of characters of three species of Stewartia.**

	S. ROSTRATA	S. SINENSIS	S. SERRATA
CHARACTER			
bark	non-exfoliating, close with shallow fissures	exfoliating, smooth, & mottled	exfoliating, smooth, & mottled
winter buds	ca. 5 mm. long, 2 or 3 imbricated scales	ca. 1 cm. long, 4 or 5 imbricated scales	4–6 mm. long, 2 imbricated scales
ovary shape	subglobose or globose, 5- or 6-angled	cylindrical, faintly 5- or 6-angled	globose, 5-angled
ovary surface	densely sericeous at the very base, glabrous above	densely pilose over the entire surface	completely glabrous
style length	1.6–1.8 cm.	0.6–0.8 cm.	1.7–2.0 cm.
ovule/ seed no. per locule	4	2	2
capsule shape & surface	subglobose, 5- or 6-angled & rostrate, finely pubescent at base	ovoid, 5- or 6-angled & rostrate, finely pilose	subglobose, 5-angled & shortly rostrate, glabrous
seed length, surface	8–10 mm., finely rugose	7–9 mm., finely puncticulate	9–12 mm., finely puncticulate

Stewartia rostrata is readily distinguished from *S. sinensis* and its closest ally, the Japanese *S. serrata*, by a number of characters, several of which are listed in TABLE 1, while some morphological details of *S. rostrata* and *S. sinensis* are illustrated in FIGURE 2.

In the horticultural trade plants of *Stewartia rostrata* may be listed and sold as *S. sinensis*. The one living specimen of *S. rostrata* at the Arnold Arboretum was grown from seed obtained from the Lu-Shan Arboretum in China in 1936, and seeds and propagating material from this large shrub, now about 4 m. tall, have undoubtedly been distributed as *S. sinensis*.

5. **Stewartia sinensis** Rehder & Wilson, Pl. Wilsonianae 2: 395. 1915. HOLOTYPE: *Wilson 2148* (A!); isotypes (A! E! K, two sheets!). FIGURE 2, f–j.

Stewartia gemmata Chien & Cheng, Contr. Biol. Lab. Sci. Soc. China, Bot. Ser. **6**: 66. 1931. SYNTYPES: *Chien 737*, *Ching 3006* (Herb. Biol. Lab. Sci. Soc. China, Nanking, not seen); ISOSYNTYPES: *Chien 737* (A! K!), *Ching 3006* (A, two sheets! K, two sheets!).

Stewartia monadelpha sensu Bean, Trees & Shrubs Hardy Brit. Isles, ed. 1. 2: 553. 1914, non Siebold & Zuccarini.

Ascending shrubs with several branches from the base or small trees to ca. 20 m. (?); periderm on young shoots flaking or exfoliating in thin strips, the bark becoming smooth and mottled with alternating reddish-brown and lighter buff-colored areas, exfoliating in thin sheets; winter buds compressed, relatively large, ca. 1 cm. long with 4 or 5 silvery-pubescent imbricated scales. Leaves with petioles 3–10 mm. long, shallowly grooved on the adaxial surface; blades ovate, elliptical, or oblanceolate, 3–10.5 cm. long, 1.4–4.5 cm. wide, with acuminate apices, serrate margins, and rounded or cuneate bases, both surfaces sparsely but finely sericeous, becoming glabrous. Flowers axillary, the pedicels (3–)10–16(–29) mm. long; bracts subtending the calyx often appearing articulated on the base of the calyx, foliaceous, subopposite, ovate with acuminate apices and irregularly serrate margins, (9–)11–19 mm. long, 7–11 mm. wide, persistent. Sepals 5, erect in bud, finely pubescent on the abaxial surface at the base, an outer pair resembling the bracts in outline and size, (9–)11–20 mm. long, 7–11 mm. wide, the 3 inner sepals ovate to lanceolate in outline, 11–20 mm. long, 3–5 mm. wide; sepals persistent, becoming lignified at the base, in fruit spreading slightly, or erect and appressed to the dehisced capsule. Petals 5, connate at the base, obovate to suborbicular with slightly erose margins and cuneate bases, 2.5–3.2 cm. long, 1.5–2.5 mm. wide, the abaxial surface sericeous. Stamens numerous, the filaments up to 20 mm. long, connate at the base into a tube 5 or 6 mm. long, the tube adnate to the base of the corolla, the free portions of the filaments glabrous or with scattered hairs at their bases; anthers yellow. Ovary cylindrical, 6–7 mm. long during anthesis, densely pilose over the entire surface, tapering into a glabrous style; style 6–8 mm. long, terminating in 5 or 6 marginally ciliate stigmatic arms, each arm ca. 2 mm. long.

Capsules grayish brown, finely pubescent, particularly at the rostrate apices, ovoid and 5- or 6-ribbed, 14–19 mm. long, 9–12 mm. broad, the styles deciduous at apex, dehiscing into 5 or 6 locules, the locule walls 3–5 mm. wide. Seeds 2 per locule, 7–9 mm. long, 4 mm. wide, planoconvex, obovate in outline, obtuse at the base with a very narrow wing surrounding the raised central portion, the wing often emarginate at apex, the surface finely puncticulate, grayish brown.

DISTRIBUTION: Moderate elevations in the mountainous regions of east-central China; infrequently cultivated in western gardens.

Representative specimens. **China.** ANHWEI PROVINCE: Wangshan, southern Anhwei, *R. C. Ching 3006* 15 VII 1925 (A, two sheets, K, two sheets); same locality, *R. C. Ching 3023* 15 VII 1925 (A, two sheets, E); same locality, *W. C. Cheng 4203* 21 X 1933 (BM, P, US). CHEKIANG PROVINCE: western Tien-mu-shan, *S. S. Chien 737* 11 VIII 1929 (A, K); Tihtaishan at 3,500 ft., *R. C. Ching 1533* 10 V 1924 (A, E, US); near Siachu at 300–1000 m., *R. C. Ching 1644* 24 V 1924 (A, two sheets, US); no locality or date, *R. C. Ching 4584* (A); west Tienmu at 3,000 ft., *H. H. Hu 1643* 22 VI 1927 (A); Tien-tai-shan at 2,400 ft., *Y. L. Keng 1083* 13 VIII 1927 (A); no localities or collectors, Lingnan University Nos. *78228, 78229, 78230* (A, three sheets). HUPEH PROVINCE: no locality, *A. Henry 6166* 1885–88 (A, BM, GH, US, paratypes); western Hupeh, *E. H. Wilson 2148* VII 1901 (A, two sheets, E, K, two sheets). KIANGSI PROVINCE: near Kuling, *W. Y. Chun 4288* 26 X 1922 (A); Chuen Yuen, *Z. S. Chung 81971* 14 VI 1937 (A); Lushan Mountains at 700–800 ft., *H. H. Chung & S. C. Sun 164* 28 VI 1933 (A); same locality, *H. H. Chung & S. C. Sun 578* 19 VII 1933 (A); same locality, *H. H. Hu 2363* VIII 1934 (A); Land's End *A. N. Steward 2687* 31 VIII 1922 (A, E); Huang Ai Sze, *A. N. Steward 4665* 26 VIII 1923 (A, US); Kuling, at 4,000 ft., *E. H. Wilson 1722* 29 VII 1907 (A, paratype); same locality, *E. H. Wilson 1722* 31 VII 1907 (E, GH, US, paratypes, all mixed collections with *S. rostrata*). SZECHWAN PROVINCE: no locality, *A. Henry 7392* 1885–88 (BM, GH, P, paratypes); Mushan [Hsien], *A. Henry 7392a* 1885–88 (A, US, paratypes).

Cultivated: **England.** DEVON: Cann House, Crown Hill, *H. W. Grigg, s.n.* (K). CORNWALL: garden of G. H. Johnstone, Grampound Road, 12 VII 1934 (K). SURREY: Royal Botanic Gardens, Kew, Acc. # 641–10–64102, *W. T. Gillis, s.n.* VI 1973 (AAH). Without locality: (BM, two sheets). **United States.** DISTRICT OF COLUMBIA: U.S. Natl. Arboretum, Acc. # 912, *P. M. Mazzeo, s.n.* 23 VI 1965 (MOAR). MASSACHUSETTS: Arnold Arboretum, plant grown from seed received from Sun Yat Sen Memorial Park, Nanking, China, 1934, Acc. # 531–34–C, *E. Murray 316* 7 IV 1965 (AAH); same Acc. #, *A. C. Gibson 783* 20 VI 1969 (AAH); same locality, no Acc. #, *T. R. Dudley, s.n.* 18 VIII 1960 (AAH).

In the protologue accompanying the description of *Stewartia sinensis*, Rehder and Wilson cite two of Wilson's Chinese collections (and one of seed) from western Hupeh and Kiangsi Provinces, as well as three collections by Augustine Henry from Hupeh and Szechuan Provinces. Wilson's number 2148 is designated as the type. In the herbarium of the Arnold Arboretum, Cambridge, Wilson's number 2148 is represented by two sheets, one of which has, above the label, in Wilson's hand, "Type." This sheet, therefore, is the holotype of the name *Stewartia sinensis*.

Careful examination of the paratypes reveals that two taxa are present. All of the Henry collections (including one flowering and two fruiting collections) correspond with the holotype, but the remaining Wilson collection (number 1722) consists of fruiting material of *Stewartia rostrata* and on some sheets of this collection, foliage of *S. sinensis* as well. It is apparent that Rehder and Wilson inadvertently assumed that the fruiting specimens of *S. rostrata* represented the same taxon as the flowering collections. Moreover, although their description of *S. sinensis* encompasses some aspects of *S. rostrata*, vegetative, floral, and fruit characters evident in the holotype and paratypes indicate differences sufficient for maintaining the two taxa as distinct.

The periderm on young branches of the holotype of *Stewartia sinensis* is a rich reddish-brown color, very smooth and, in places, exfoliating in thin, irregular patches. On young branches of *S. rostrata* the periderm is grayish brown, closely and finely fissured, and tends to exfoliate in long, very thin strips. The terminal and lateral buds of *S. sinensis* are relatively large (ca. 1 cm. long) and consist of 4 or 5 imbricated scales, while those of *S. rostrata* are half as long (ca. 5 mm.) and consist of 2 or rarely 3 imbricated scales. Finally, the ovaries of the flowering specimens of *S. sinensis* are pilose over the entire surface, as are the capsules of the fruiting Henry collections (numbers 7392 and 7392a). The capsules of *S. rostrata* present in Wilson's collection 1722, however, are glabrous except at the very base.

In describing *Stewartia gemmata*, here reduced to synonymy under *S. sinensis*, Chien and Cheng contrasted *S. gemmata* with *S. sinensis*, from which *S. gemmata* was stated to differ in its variable pedicel length, its completely pubescent ovary, its pale-brown, smooth bark, and its distinct winter buds. An examination of type material of *S. sinensis* and comparisons between these collections and the isosyntypes and paratypes of *S. gemmata* indicate that Chien and Cheng inadvertently redescribed plants corresponding to *S. sinensis*. Although Chien and Cheng were apparently aware that two elements were passing under the name *S. sinensis*, they did not know which of the two elements corresponded with the holotype of that species. As a result of this situation, the unnamed taxon is described here as the new species, *S. rostrata*.

Stewartia sinensis and *S. monadelpha* of Japan are very closely related taxa, here treated as distinct species. All the floral parts of *S. sinensis* are larger; in addition, its ovoid floral bracts are subequal to the five calyx lobes. In *S. monadelpha* on the other hand, the oblong floral bracts are longer than the small, ovoid-deltoid calyx lobes. Styles of *S. sinensis* are 6–8 mm. long, and the seeds range in length from 7 to 9 mm., while in *S. monadelpha* the styles are 3–4 mm. and the seeds 5–6 mm. long. Further studies, particularly genetic and breeding investigations, may indicate a relationship between the two species best expressed by treating *S. sinensis* as a subspecies of *S. monadelpha*.

6. **Stewartia monadelpha** Siebold & Zuccarini, Fl. Japonica 1: 181. *t. 96*. 1841. HOLOTYPE: *H. Bürger*, presumably at LE, but not seen. FIGURES 2, k–o, and 3.

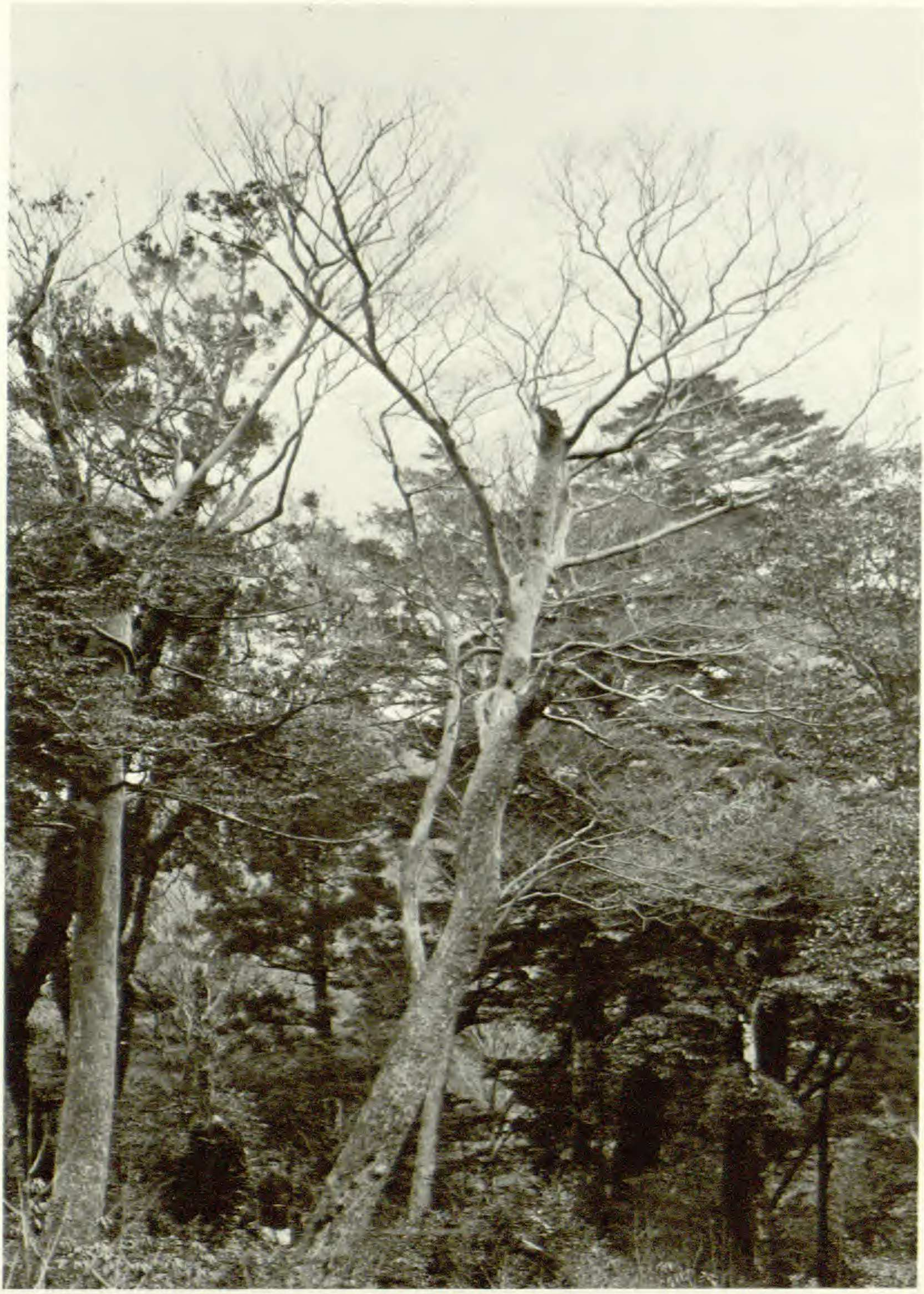

FIGURE 3. **Stewartia monadelpha.** Photograph by E. H. Wilson (negative #4739) of several large trees of *S. monadelpha* at 780 m. in a *Trochodendron-Abies* forest on the Japanese island of Yakushima in February, 1914. The large tree in the center foreground measured 17 m. in height and ca. 2.5 m. d.b.h.; for scale, note the man in white pants standing to the left of this center tree.

Stewartia sericea Nakai, Bull. Natl. Sci. Mus. Tokyo **29:** 92. 1950. HOLOTYPE: *Y. Hayashi, s.n.* (TNS, sheet #80767!).
Stewartia monadelpha Siebold & Zuccarini forma *sericea* (Nakai) Hara, Enum. Spermatophytarum Jap. **3:** 169. 1954.

Shrubs with several branches from the base or trees to 25 m.; periderm on young shoots exfoliating in thin strips or flakes, the young branches pubescent, becoming smooth and reddish brown; bark smooth and mottled with alternating reddish-brown and lighter buff-colored areas, exfoliating in thin sheets; winter buds compressed, ca. 7 mm. long with 3–5(–7) finely pubescent, imbricated scales. Petioles 4–15 mm. long, shallowly grooved on the adaxial surface; leaf blades ovate, elliptical to lanceolate, 4.2–10 cm. long, 1.6–3.4 cm. wide, with finely crenate-serrulate margins ciliate when young and with incurved teeth, acuminate apices, and broadly to narrowly cuneate or attenuate bases; upper and lower surfaces of the blades finely appressed-pubescent, primarily along the veins, often with axillary tufts of hairs in the axils of the midvein and lateral veins beneath. Flowers axillary, very rarely 2 together, the pedicels (5–)7–10(–16) mm. long; the persistent bracts subtending the calyx foliaceous, subopposite, oblong to oblong-ovate, 9–17 mm. long, 4–7 mm. wide, with acuminate to obtuse apices and finely serrulate margins. Sepals 5, connate at the base, the free lobes subequal, ovate to suborbicular, 5–7 mm. long, 3–4 mm. wide, with acute to acuminate apices; calyx persistent, appressed to the lower portion of the maturing capsule, in fruit the lobes erect or slightly reflexed. Petals 5, connate at base, obovate to suborbicular with slightly erose margins and cuneate bases, 11–15 mm. long, 8–12 mm. wide, the abaxial surface sericeous. Stamens numerous, the filaments connate at the base into a tube ca. 4 mm. high, the tube adnate to the base of the corolla; free portions of the filaments finely pubescent, up to 10 mm. long. Ovary conical, 5-angled, 3–5 mm. long at anthesis, densely pilose and tapering into the basally pilose style; style glabrous above, 3–4 mm. long, terminating in 5 stigmatic arms, the arms 1–2 mm. long. Capsules 11–14 mm. long, 7–11 mm. broad, ovoid, reddish brown, finely pubescent, particularly at the rostrate apices, 5- or occasionally 6-ribbed, dehiscing apically into 5 or 6 locules, the valve walls 4–5 mm. wide. Seeds 2 per locule, 5–6 mm. long, 3–4 mm. wide, planoconvex, irregularly obovate in outline, reddish brown, the base often shallowly notched, the raised central portion surrounded by a very narrow wing; surface finely puncticulate. $2n = 30$.

DISTRIBUTION: Known from a few collections from mountainous regions of south-central Honshu, Kyushu, and Shikoku Islands, Japan; cultivated in western gardens.

Representative specimens. **Honshu.** PREF. KANAGAWA: Hakone, *K. Hisauchi, s.n.* 19 X 1950 (TNS); Yokohama (Hakone), *Maximowicz, s.n.* 1862 (BM, GH, P, a mixed collection with *S. serrata*); Hakone, bark orange-brown, smooth and glossy, *M. Mizushima 765* 28 XI 1950 (A); Hakone, *T. Sawada 2175* 21 VI 1927 (A). PREF. SHIZUOKA: Mt. Tochu, Misakubo-cho, Shûchi-gun at 1000 m., *Y. Hayashi, s.n.* 20 X 1949 (TNS); Mt. Ashitaka, *J. Sugimoto, s.n.* 7 VIII 1962

(TNS). **Kyushu.** PREF. KAGOSHIMA: Mt. Kirishima at 100–1000 m., *Z. Tashiro, s.n.* 19 VIII 1917 (A); Island of Yaku or Yakushima, in mountains, *U. Faurie 3801* 1900 (BM); Island of Yaku, Mt. Nagata, *Z. Tashiro, s.n.* 9 VIII 1923 (TNS); Island of Yaku at 300–1500 m., tree with pale brown bark, 15–25 m. tall, 2–4 m. in diameter, *E. H. Wilson 6024* 20 II 1914 (A, three sheets, BM, GH). Without definite locality: Herb. Zuccarinii, *H. Bürger, s.n.* (K); Herb. Zuccarinii, *Siebold, s.n.* 1842 (GH); Herb. Zuccarinii, *Siebold, s.n.* 1843 (K); *M. Blume, s.n.* (P).

Cultivated. **England.** SUSSEX: Nymans Gardens, Handcross, *no collector* 5 VIII 1965 (K, two sheets). **Germany.** Hortus H. A. Hesse, Weener, *O. Luyken, s.n.* 1931 (AAH). **New Zealand.** Botanical Garden, Christchurch, South Island, *W. R. Sykes 124914* 1 XI 1962 (AAH). **United States.** CONNECTICUT: Stamford, lot W of Stamford Hospital, *R. P. Marshall, s.n.* 19 IX 1933 (AAH). DISTRICT OF COLUMBIA: U.S. Natl. Arboretum, *P. Mazzeo, s.n.* 23 VI 1965 (MOAR). MASSACHUSETTS: Arnold Arboretum, plant from seed from F. M. Ellis, Griffin, Ga. Acc. # 22392–A, *E. J. Palmer, s.n.* 5 VII 1938 (AAH, MOAR). NEW YORK: New York Botanical Garden, *H. Teuscher, s.n.* 20 VI 1935 (AAH). PENNSYLVANIA: Barnes Arboretum, *J. M. Fogg, Jr., s.n.* 22 VI 1962 (AAH, two sheets, MOAR, three sheets), 6 VIII 1962 (MOAR), 28 VI 1963 (MOAR), 3 VII 1967 (MOAR); Ellis School Arboretum, Newton Square, *J. M. Fogg, Jr., s.n.* 13 VII 1962 (MOAR, four sheets); Morris Arboretum Acc. # 58–186A, *J. M. Fogg, Jr., s.n.* 26 VI 1962 (A, MOAR), Acc. # 54–965, *J. M. Fogg, Jr., s.n.* 1 IX 1964 (MOAR), Acc. # 57–251A, *J. M. Fogg, Jr., s.n.* 1 IX 1964 (MOAR); Ker Feal, Chester County, *J. M. Fogg, Jr., s.n.* 2 VI 1962 (MOAR), 11 VII 1968 (AAH, MOAR); F. D. Moore & Sons Nurseries, Penn Valley, *J. M. Fogg, Jr., 22331* 7 VII 1965 (MOAR).

Siebold and Zuccarini based *Stewartia monadelpha* on a collection made by Dr. Heinrich Bürger from the mountains on the island of Shikoku, Japan. Presumably, the holotype is among the 800–1000 Japanese types and 850 drawings in the Siebold and Zuccarini collection that, according to A. P. de Candolle, are at Leningrad. Among the specimens I have seen is a Bürger collection of *S. monadelpha* preserved at Kew. This is undoubtedly authentic material, probably an isotype, but such designation cannot be made until the collections at Leningrad are examined. If, however, my supposition is correct, the Bürger collection, which lacks locality data, would be the only sheet of this taxon examined from Shikoku Island.

The relations of *Stewartia monadelpha* are with *S. sinensis* and are discussed under that species.

Stewartia sericea, segregated from *S. monadelpha* by Nakai on the basis of purported differences in pubescence of the foliage and branchlets, differs in no way from the majority of specimens of *S. monadelpha* examined during this study. As a result, *S. sericea* is reduced to the synonymy of *S. monadelpha*.

7. **Stewartia** × **Henryae** Li, Morris Arb. Bull. **15**: 15. 1964. HOLOTYPE: *H. L. Li, s.n.* 9 June 1963 (MOAR!); isotypes (MOAR, two sheets!).

[*Stewartia pseudocamellia* Maxim. (as *S. koreana* Rehder) × *S. monadelpha* Sieb. & Zucc.]

Small trees to ca. 10 m. with smooth, exfoliating bark; young branches mostly zigzagged and slightly compressed; winter buds compressed, ovoid and pointed at the apex, 6–7 mm. long with 3 or 4 silky, imbricated scales. Petioles 7–14 mm. long, shallowly grooved on the adaxial surface; leaf blades ovate to elliptical, (3.5–)5.8–8 cm. long, (2.5–)3–3.5(–5.5) cm. wide, the margins ciliate and finely rounded-serrulate with very short apiculate teeth; apices acuminate, the bases cuneate; blades finely appressed-pubescent on both surfaces, particularly along the veins of the lower surface. Flowers axillary, pedicels 13–20 mm. long; persistent bracts subtending the calyx, foliaceous, subopposite, oblong to oblong-ovate, 12–13 mm. long, 7 mm. wide, with acute or rarely obtuse apices and finely serrulate margins. Sepals 5, connate at base, the free lobes subequal, suborbicular, 8–9 mm. long, 6–7 mm. wide, with rounded apices, irregularly and finely serrulate margins, silky-sericeous on the abaxial surfaces; sepals persistent, appressed to the lower half of the maturing capsule, the lobes erect or slightly reflexed in fruit, eventually deciduous. Petals 5, connate at the base, obovate to suborbicular, 2.5–2.8 cm. long, 2.1–2.7 cm. wide, with finely erose margins, the abaxial surfaces sericeous. Stamens numerous, the filaments connate at the base into a tube ca. 5 mm. long, the tube adnate to the base of the corolla, free portions of the filaments ca. 10 mm. long, the bases of the filaments finely pubescent. Ovary conical, 5-lined, ca. 9 mm. long at anthesis, pilose, the glabrous style ca. 4 mm. long above, terminating in 5 stigmatic arms, each arm ca. 1 mm. long. Capsules 13–23 mm. long, 10–16 mm. broad, ovoid, reddish brown, finely appressed-pubescent, 5-ribbed, dehiscing apically into 5 locules, the valve walls 5–6 mm. wide. Seeds 2 per locule, 6–7 mm. long, 5–6 mm. wide, planoconvex, irregularly subovate in outline, the base and the winged apex shallowly notched, reddish brown, the raised central portion finely rugose.

DISTRIBUTION: Occurring spontaneously, known from several small trees and seedlings in cultivation at the Henry Foundation for Botanical Research, Gladwyne, Pennsylvania. In addition to the types, it is represented by the following two collections.

United States. PENNSYLVANIA: Henry Foundation, *H. L. Li, s.n.* 12 I 1964 (MOAR, paratype), *S. A. & H. C. Spongberg 73–184* 8 V 1973 (AAH).

Stewartia × *Henryae* differs only slightly from *S. pseudocamellia* (*S. koreana*), and most of the characters by which Li establishes the position of *S.* × *Henryae* between *S. pseudocamellia* and *S. monadelpha* are open to modification. Examination of a series of preserved specimens of both putative parents from the Henry Foundation indicates that in most instances the measurements and character states listed as differing between *S.* × *Henryae* and *S. pseudocamellia*, the putative seed parent, can be revised reducing the differences between the two taxa. Data listed under bract number and branchlet pubescence for *S.* (*koreana*) *pseudocamellia* are incorrect on the basis of my studies. Young branchlets of *S. pseudo-*

camellia may be slightly pilose, at least to the degree exhibited by branchlets of *S.* × *Henryae*. Furthermore, I have not seen flowers of *S. pseudocamellia* subtended by more than two bracts, whereas Li lists the usual numbers as four or five. The only differences found to support the putative hybrid status of *S.* × *Henryae* are the decidedly greater length and shape of the floral bracts, the smaller petal dimension (resulting in a smaller flower diameter), and the presence of two ovules and/or seeds per ovary locule. All three of these characters, as exhibited by flowers of *S.* × *Henryae*, are suggestive of flowers of *S. monadelpha*, but until cytological investigations and controlled hybridization experiments can be conducted, the status of *S.* × *Henryae* must, in my opinion, remain tentative.

8. **Stewartia pseudocamellia** Maximowicz, Bull. Acad. Sci. St.-Pétersb. III. 11: 429. 1867; Mél. Biol. Acad. Sci. St.-Pétersb. 6: 201. 1867, "*Stuartia*." HOLOTYPE: cultivated at Tokyo, presumably at LE, but not seen.

Stewartia grandiflora Carrière, Rev. Hort. **1874**: 399. 1874.
Stuartia grandiflora Siebold ex Briot, Rev. Hort. **1879**: 430. 1879.
Stuartia japonica Hort. ex Nicholson, Kew Handb. Trees & Shrubs **1**: 41. 1894, pro. syn.
Stewartia koreana Nakai ex Rehder, Jour. Arnold Arb. **7**: 242. 1926; emend. Rehder, *Ibid.* **9**: 31. 1928. HOLOTYPE: *E. H. Wilson 9596* (A!); isotypes (A! BM! US!).
Stewartia pseudocamellia var. *koreana* (Nakai ex Rehder) Sealy, Bot. Mag. **165**: *t. 20*. 1948.

Small trees to 20 m., usually with several limbs from a short trunk; periderm on young branches exfoliating in thin strips or flakes, the branchlets dark blackish- or silvery-gray, often zigzagged and compressed; bark smooth and mottled with alternating pinkish, brownish, and grayish areas; winter buds compressed, 7–11 mm. long, with 2–4 finely pubescent imbricated scales. Petioles 4–10(–15) mm. long, shallowly grooved on the adaxial surface; leaf blades broadly ovate to elliptical, (1.5–)3.5–11.5 cm. long, (1.5–)2.5–6(–8) cm. wide, with acute to acuminate apices, shallowly serrate margins, the teeth with short, blackish points, and rounded to cuneate bases. Flowers axillary, rarely terminal, pedicels (0.8–)1–4 cm. long, seemingly increasing in length after anthesis; bracts subtending the calyx subopposite to distinctly alternate, much smaller than and closely appressed to the sepals, broadly reniform to oblong in outline with ciliate margins, sometimes with an acute apex, 4–8 mm. wide, 5–8 mm. long, the margins often overlapping laterally, persistent. Sepals 5, enclosing the flower in bud, thickened and connate at base, the free lobes subequal, suborbicular, 7–13 mm. long, (7–)9–11 mm. wide, with rounded or occasionally acute apices, densely silky sericeous abaxial surfaces, and entire or ciliate margins; calyx persistent, almost totally enclosing the maturing capsule, remaining erect or often reflexed or partially deciduous in fruit. Petals 5, densely silky sericeous on the abaxial

surface, connate at the base, suborbicular or scallop-shaped, 3–4.6 cm. long, (1.5–)2–4 cm. wide, the margins wavy and erose. Stamens numerous, the filaments up to 20 mm. long, connate at the base into a tube ca. 5 mm. long, the tube adnate to the base of the corolla, the free filaments glabrous. Ovary conical, basally 5- or 6-lobed and densely pilose, 5–8 mm. long at anthesis, tapering into a glabrous 5- or 6-ribbed style 8–11 mm. long, the style terminating in 5 or 6 marginally ciliate stigmatic arms, the arms 1–2 mm. long. Capsules light to dark reddish brown, finely appressed-pubescent, ovoid with rostrate apices and strongly 5- or 6-angled, variable in size, (13–)15–24 mm. long, (9–)11–18 mm. broad, dehiscing into 5 or 6 locules, the locule walls 6–8 mm. wide. Seeds 4 per locule, 2 often aborted, 5–8 mm. long, (3.5–)4–5 mm. wide, reddish brown or purplish, ovate, obovate, or oblong in outline with an obtuse apex, essentially wingless, the surface of the raised central portion puncticulate or often finely rugose. $2n = 30$.

DISTRIBUTION: Mountainous regions of Northern and Central Honshu, Kyushu, and Shikoku Islands, Japan, and in mountainous areas of the southern Korean peninsula; widely cultivated in western gardens.

Representative specimens. Japan. **Kyushu.** PREF. KAGOSHIMA: Mt. Ônamicke at 1400 m., *T. Tanaka 100183* 4 VIII 1924 (A); Mt. Kirishima at 100–1000 m., *Q. Tashiro, s.n.* 24 VII 1917 (A). Without locality: small tree 4–8 m. high, at 600–1000 m. *E. H. Wilson 6231* 8 III 1914 (A). **Honshu.** PREF. CHIBA: near Usui (?) at 4,000 m., *P. H. Dorsett & W. J. Morse 985* VIII 1929 (A, US). PREF. GIFU: no locality, *K. Shiota 90* 17 VIII 1927 (A), *K. Shiota 7598* 10 VII 1934 (A), *K. Shiota 3860* 3 VII 1928 (A), *K. Shiota 112* 28 VII 1929 (A). PREF. GUMMA: Mt. Myôgi, *N. Ishii, s.n.* 20 VIII 1961 (TNS); same locality, *M. Mizushima 11653* 5 IX 1953 (A); Mt. Akagi-san at 1300 m., *M. Nishida 2687* 10 VIII 1950 (A); Mt. Haruna, *S. Okuyama 9234* 11 VII 1937 (TNS); Mt. Akagi, *T. Wakana, s.n.* 1 VII 1968 (TNS). PREF. HYOGO: Hyôgoken, *K. Uno 24145* 17 VIII 1939 (A). PREF. KANAGAWA: Yokohama, *Maximowicz, s.n.* 1862 (BM). PREF. KYOTO: Sirakawa, *H. Muroi 2762* 25 VI 1955 (A). PREF. MIYAGI: Hanaizumi, *H. Muroi 4700* 15 VIII 1955 (A). PREF. NARA: Ōdaigaharasan, *M. Kume, s.n.* 26, 27 VIII 1943 (A). PREF. NAGANO: Kutsukake-Kose at 100 m., *M. Mizushima 10165* 15 VIII 1951 (A); without locality, *R. Yatabe, s.n.* 19 VII 1880 (A). PREF. NIIGATA: Mt. Yahiko, *S. Togasi 1774* 3 VII 1958 (A, E, TNS, US). PREF. SAITAMA: Nishitama-gun at 1120 m., *M. Mizushima 2573* 14 VIII 1954 (A). PREF. SHIGA: en route from Yakumoga-hara to summit of Bunagatake in Hira Mountains at ca. 1000 m., *K. Seto 5913* 4 VIII 1955 (TNS). PREF. TOCHIGI: Nikko, Urami-ga-taki, *J. Bisset 4210* VIII 1887 (BM, E, two sheets); Nikko, *J. Bisset 4232* VIII 1887 (BM, E); Nikko Mountains, *L. Boehmer, s.n.* (A); Hanaishi, Urami, Nikko, *M. Mizushima 2114* 12 VIII 1952 (A); shores of Lake Chuzenji, in forest, large tree, *M. Mizushima 2294* 5 VII 1952 (A); same locality, *M. Mizushima 2312* 5 VII 1952 (A); Mt. Hikosan, *K. Sakurai, s.n.* 15 VII 1909 (A); Nikko, *H. Sakurai, s.n.* 2 VIII 1909 (E); shores of Lake Chuzenji, tree 40–50 ft. × 2 ft., *C. S. Sargent, s.n.* 3 IX 1892 (A, two sheets); same locality, *S. Suzuki 348* 23 VII 1939 (A); Nikko, Yokohama Nursery Co., Ltd. VIII 1904, 1906 (E, two sheets); without locality, *E. H. Wilson 7677* 21 X 1914 (A, US). PREF. TOYAMA: Arimine, Kaminiikawa-gun,

T. Yamazaki 9781 4 VIII 1965 (A). PREF. YAMANASHI: Mitsu-tôge, *S. Okuyama 15379* 7, 8 IX 1955 (TNS); same locality, tree 10 m. high, 12 cm. d.b.h., *S. Suzuki 91* 15 VII 1952 (A). **Shikoku.** PREF. EHIME: Futatsuno, Iyo, *K. Watanabe, s.n.* 5 VIII 1888 (GH). Without locality: *U. Faurie 6125* VIII 1904 (A, two sheets, BM, P); *N. Mochizuki, s.n.* V 1912 (E); *N. Mochizuki, s.n.* IX 1910 (E); *T. Takemoto 113* (A); *Tschonoski, s.n.* 1864 (BM, GH, P, US). **Korea.** PROV. S. KEISHO: Mt. Kirishan, *R. K. Smith 654* 9 VIII 1934 (A, US); same locality, *K. Uno 23356* 7 VIII 1938 (A); same locality, *K. Uno 23421* 7 VIII 1938 (A); tree, 15–40 ft. × 1–3 ft., common in woods, Mt. Kirishan, *E. H. Wilson 9596* 14 XI 1917 (A, two sheets, BM, US). Province uncertain: Mt. Kaya, Kyongsang-Pukdo, *C. In-Cho 1145* 13 VI 1947 (MICH); Mt. Songni, Chung-chong, *C. In-Cho 3371* 27 V 1948 (MICH); Zennan, no collector, 7 VIII 1935 & 17 VII 1936 (TNS, two sheets).

Cultivated. **England.** CORNWALL: Trebah, *Hext, s.n.* IV 1938 (BM). HAMPSHIRE: Exbury, Southampton, Hortus Major Rothschild, *A. B. Jackson, s.n.* 2 VII 1945 (BM). SURREY: Royal Botanic Gardens, Kew, Acc. # 071:42, *W. T. Gillis, s.n.* VI 1973 (AAH); same locality, no collector, 10 VII 1947 (K). SUSSEX: Borde Hill, *A. B. Jackson, s.n.* 15 VI 1940 (BM). **France.** Hortus Vilmorin, *R. L. de Vilmorin, s.n.* 30 VI 1927 (AAH). **Japan.** PREF. TOKYO: gardens in Yedo, *R. Fortune, s.n.* VI 1861 (BM). **New Zealand.** South Island, Botanic Garden, Christchurch, *W. R. Sykes 1069* 29 XI 1962 (AAH). **Scotland.** Edinburgh, Royal Botanic Garden VI 1956 (E). **United States.** DELAWARE: Greenville, Mt. Cuba Botanical Park, *R. C. Bauman 168* 30 IX 1969 (AAH); same locality, *S. L. Kelsey 158* (AAH). DISTRICT OF COLUMBIA: U.S. National Arboretum, *F. G. Meyer & P. Mazzeo, s.n.* 23 VI 1965 (MOAR). MASSACHUSETTS: Arnold Arboretum, Acc. #11440–A & B, plants grown from seed collected by E. H. Wilson in Korea, 1918, *A. C. Gibson 268* 22 VII 1968 (AAH), *M. Holland & N. Payne, s.n.* (AAH, two sheets), *E. J. Palmer, s.n.* 29 VI 1942 (MICH), *A. Rehder, s.n.* 21 IX 1922 (AAH), *A. Rehder, s.n.* 2 XI 1926 (AAH, two sheets), *A. Rehder, s.n.* 22 IX 1927 (AAH, two sheets), *A. Rehder, s.n.* 27 IX 1927 (AAH); Acc. #405–42A, plant from F. W. Schumacher, Jamaica Plain, 1882, *J. M. Fogg, Jr., 22404* 7 X 1965 (MOAR), *S. Kreps, s.n.* 10 VII 1965 (AAH); Northampton, Smith College Botanic Garden, *M. Campbell, s.n.* 1965 (AAH, five sheets). NEW YORK: Glen Cove, Hortus C. A. Dana, 4 VII 1888 (AAH). NORTH CAROLINA: Biltmore, *Biltmore Herb. 5761* 14 VII 1897 (AAH). PENNSYLVANIA: Merion, Barnes Arboretum, *J. M. Fogg, Jr., s.n.* 22 VI 1962 (AAH); Morris Arboretum, Acc. # 64–659, *J. M. Fogg, Jr., s.n.* 29 VI 1967 (AAH); Swarthmore, Scott Foundation, *J. M. Fogg, Jr., s.n.* 29 VI 1962 (AAH, two sheets).

The most widely cultivated *Stewartia* in western gardens, *S. pseudocamellia* was described by Maximowicz from specimens collected in Japanese gardens in Tokyo. The type is presumably among Maximowicz's collections at Leningrad, yet specimens at BM, GH, P, and US collected in 1864 by Tschonoski, Maximowicz's Japanese assistant, may constitute part of the type material. In addition, there is an 1862 Maximowicz collection from Yokohama at the British Museum which may also be type material.

Stewartia pseudocamellia is readily distinguished from other deciduous species of the genus by its small broadly reniform to suborbicular floral bracts that are conspicuously shorter than the calyx, the densely sericeous

abaxial surfaces of the sepals, and its usually compressed and often zigzagged branchlets. As a distinct taxon, the affinities of *S. pseudocamellia* with other deciduous species are obscure and may rather be with the evergreen species that have been treated as members of the genus *Hartia*.

Rehder based *Stewartia koreana* on fruiting specimens collected by E. H. Wilson in Korea and on plants grown at the Arnold Arboretum from seeds from Wilson's collection. He distinguished the new taxon from *S. pseudocamellia* on the basis of sepal shape and a combination of leaf characters including shape, margin, indument, texture, and autumn coloration. He also stated that branchlets of *S. koreana* tend to be compressed and zigzagged, while in *S. pseudocamellia* they are terete and relatively straight. In 1928, after the plants grown from Wilson's seeds had flowered, he amended the description with details of floral morphology but concluded that flowers of *S. koreana* were not different from those of *S. pseudocamellia* except that the corolla is slightly larger and flatter, resulting in a more showy, open flower in *S. koreana*.

According to Sealy (1948), who reduced *Stewartia koreana* to a variety of *S. pseudocamellia*, the morphological characters stated by Rehder as distinguishing the two taxa "do not exist . . . whilst others break down." Sealy's contention that *S. koreana* was deserving of varietal rank, however, was based on its flatter, saucer-shaped corolla; in addition he observed that in var. *koreana* the leaves are slightly smaller, more oval in outline, and the pedicels are shorter.

Examination of herbarium specimens and plants of both taxa cultivated at the Arnold Arboretum has led me to conclude that there are no reliable morphological distinctions that separate plants of the two taxa. Sealy's observations that the leaves and pedicels of var. *koreana* are slightly smaller than those of var. *pseudocamellia* are in general true, yet the size and length variation in these two characters within his var. *koreana* is as great as that within var. *pseudocamellia*. As a result, *Stewartia koreana* is treated here as conspecific with *S. pseudocamellia*.

Observations that plants from Korea differ from those of *Stewartia pseudocamellia* from Japan in autumn coloration, saucer-shaped flowers, and a prolonged blooming period appear to be correct for Korean plants I know of in cultivation. It should be pointed out, however, that most of the Korean plants in cultivation at the Arnold Arboretum represent plants derived from Wilson's original seed collection and are, as a result, plants of one or perhaps a few clones. If these variations are to be recognized, particularly in the horticultural trade, recognition as a named cultivar would be desirable.

REFERENCES

AIRY-SHAW, H. K. Notes on the genus *Schima* and on the classification of the Theaceae–Camellioideae. Kew Bull. **1936**: 496–500. 1936.

BALDWIN, J. T., JR. A seventeenth century record for *Stewartia*. Rhodora **71**: 434–438. 1969.

———. *Stewartia ovata* on the Coastal Plain of Virginia. Am. Hort. Mag. **49:** 88–90. 1970.

BENTHAM, G. Notes on Ternstroemiaceae. Jour. Linn. Soc. Bot. **5:** 53–65. 1860.

——— & J. D. HOOKER. Ternstroemiaceae. Gen. Pl. **1:** 177–189. 1862.

CANDOLLE, A. P. DE. Ternstroemiaceae and Camellieae. Prodr. **1:** 523–530. 1824.

CATESBY, M. The natural history of Carolina, Florida, and the Bahama Islands. Vol. *2*, Appendix. *pls. 1–20.* London. 1747.

CHENG, W. C. Notes on ligneous plants of China. Contr. Biol. Lab. Sci. Soc. China Bot. Ser. **9:** 189–205. 1934.

CHOISY, J. D. Mémoire sur les familles des Ternstroemiacées et Camelliacées. Mém. Soc. Phys. Hist. Nat. Genève **14:** 115–184. *pls. 1–3.* 1855.

CHUN, W. Y. Additions to the flora of Kwangtung and south-eastern China (*2*). Sunyatsenia **2:** 49–87. *pls. 15–20.* 1934.

DEWOLF, G. P., JR. The introduction of our hardy Stewartias. Arnoldia **29:** 41–48. 1969. [The labeling of the illustrations should be corrected as follows: *S. monadelpha* = *S. sinensis*; *S. koreana* = *S. pseudocamellia*; *S. sinensis* = *S. rostrata.*]

ENDLICHER, S. Ternströmiaceae. Gen. Pl. 1017–1024. 1840; Suppl. **2:** 81. 1842.

FOGG, J. M., JR. *Stewartia* in the Philadelphia area. Morris Arb. Bull. **15:** 43–48. 1964. [*Fig. 63* is *S. rostrata*, not *S. sinensis.*]

GRAY, A. The genera of the plants of the United States. Vol. *2.* 229 pp. + *pls. 101–186.* New York. 1849. [*Stewartia*, 97–100, *pls. 138, 139.*]

GRIMES, E. J. Some interesting plants of the Virginia Coastal Plain. Rhodora **24:** 148–152. 1922.

HENRY, M. G. Stewartias. Natl. Hort. Mag. **17:** 117–121. 1938. [Reprinted, *Ibid.* **34:** 218–221. 1955.]

KENG, H. Comparative morphological studies in Theaceae. Univ. Calif. Publ. Bot. **33:** 269–384. *pls. 1–7.* 1962.

KOBUSKI, C. E. Studies in the Theaceae, XXI. The species of Theaceae indigenous to the United States. Jour. Arnold Arb. **32:** 123–138. 1951. [Includes distribution maps for *S. ovata* and *S. Malacodendron.*]

———. Footnote, p. 419 *in* C. E. WOOD, JR., 1959.

LINNAEUS, C. Decem plantarum genera. Acta Soc. Reg. Sci. Upsal. **2:** 77–84. *pl. 2.* 1746. [Published for the year 1741.]

MELCHIOR, H. Theaceae. Nat. Pflanzenfam. ed. *2.* **21:** 109–154. 1925.

MERRILL, E. D. New or noteworthy Indo-Chinese plants. Jour. Arnold Arb. **19:** 21–70. 1938.

MITCHELL, J. Dissertatio brevis de principiis botanicorum et zoologorum. 46 pp. Nürnberg. 1769. [Original publication: Acta Nat. Cur. Ephemerides 8(App.): 187–224. 1748.]

NAKAI, T. Contributions to the knowledge of flowering plants. Bull. Natl. Sci. Mus. Tokyo **29:** 71–98. 1950.

PRAIN, D. *Stewartia serrata.* Bot. Mag. **144:** *t. 8771.* 1918; *Stewartia sinensis. Ibid. t. 8778.* 1918.

REES, A. *Stuartia.* Cyclopedia Universal Dict. Arts, Sci. Lit. Vol. 34. 1816.

SANTAMOUR, F. S., JR. Cytological studies in the Theaceae. Morris Arb. Bull. **14:** 51–53. 1963. [Reports $2n = 30$ for *S. ovata, S. Malacodendron, S. serrata, S. pseudocamellia, S. monadelpha*, and *S. sinensis.*]

SCHENK, A. Palaeophytologie, Cistiflorae. IN: K. A. ZITTEL, Handb. Palaeontol. Abth. II. **6:** 515–518. 1890.

SEALY, J. R. A revision of the genus *Camellia*. viii + 239 pp. *frontisp*. London. 1958.

SZYSZYLOWICZ, I. VON. Theaceae. Nat. Pflanzenfam. III. **6:** 175–192. 1893.

WOOD, C. E., JR. Some cultivated relatives of the *Camellia*. Arnoldia **17:** 1–12. 1957.

———. The genera of Theaceae of the southeastern United States. Jour. Arnold Arb. **40:** 413–419. 1959.

WU, Y. C. Beiträge zur Kenntnis der Flora Süd-Chinas. Bot. Jahrb. **71:** 169–199. 1940.

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ADDENDUM

Since this paper was sent to the printers, an additional name, *Stewartia rubiginosa* Chang, has been located in the literature (p. 23, *fig. 6*, *in*: H. T. CHANG, Notulae Plantarum Austro-Sinicarum. Zhongshan Daxue Xuebao. Ziran Kexue. [Bull. Sunyatsen Univ., Nat. Sci.] **2:** 19–48. 1959). *Stewartia rubiginosa* was allied to *S. gemmata* (= *S. sinensis*) by Chang, but judging from the Latin description it is perhaps closer to *S. pseudocamellia*. This new species is a deciduous tree to ca. 15 m. with smooth, reddish-brown bark and short-petiolate, elliptic-ovate leaves 9–13 cm. long, 5–6.5 cm. wide. The flowers are subtended by two reniform bracts about half as long as the sepals. The ovaries are hirsute, and the corollas are comprised of large petals, 3.5–4 cm. long. Capsules are unknown. The type, *H. Fung & P. Tsang 10722*, was collected in Kwangtung Province, China, at Yingtak on Mt. Wat-shui-shan; it is presumably in the herbarium of Sunyatsen University. I have neither seen any specimens that could be referred to *S. rubiginosa*, nor have I seen any reference to this species except in the obscure original publication. If duplicates of the type collection were at one time distributed to western herbaria, Dr. S. Y. Hu of the Arnold Arboretum (whom I thank for translating the Chinese) suggests that the collection might appear under a Lingnan University number. S.A.S.